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A SURVEY OF HUMAN BRUCELLOSIS IN QUEENSLAND.[1]

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IN 1935 Duhig reported three cases of undulant fever in Queensland and commented on the low incidence of human infections compared with the wide prevalence of contagious abortion in cattle. Seddon (1939) estimated that the incidence in dairy cows was probably of the order of 10% to 20%, and that all pooled market supplies of milk were apt to contain Brucella. Writing in 1948, Seddon further reported that swine brucellosis was fairly widespread in Queensland.

Since 1935, the Laboratory of Microbiology and Pathology, Brisbane, has been especially interested in the investigation of fevers, and this interest attracted blood samples from febrile patients from practitioners in Brisbane and country districts. *Brucella abortus* was included among the organisms used in routine agglutination tests, and over a period of fourteen years the serum of 23 patients was found to give significant agglutination of that organism. These cases are listed in Table I, and to them we are able, through the courtesy of Dr. K. C. Porter and Dr. J. V. Duhig, to add two others, in which the specific tests were carried out at the Commonwealth Health Laboratory, Rockhampton, and the Brisbane Hospital Laboratory respectively.

The technique we have employed in the agglutination test has varied slightly over the years. The culture of *Brucella abortus* now in use was obtained from the Central Public Health Laboratory, London. From it an emulsion is prepared from time to time and killed with formalin (0·2%) and chloroform (0·2%). We find the test result easier to read if the emulsion is rather denser than the Oxford standard. The mixtures of emulsion and diluted serum are left overnight in the incubator at 37° C. and the result is read next morning. For the purpose of this study we have regarded as significant complete agglutination in a serum dilution of 1:80, or partial agglutination in a higher dilution.

The finding of serum agglutination does not of itself prove that the current illness was brucellosis. Satisfactory proof would have been provided by the isolation of Brucella from the blood or tissues of the patient by culture or guinea-pig inoculation. This was attempted in some of the cases, but without success except in Case XXIII; in this case Dr. E. Singer, Research Bacteriologist at the Queensland Institute of Medical Research, cultivated Brucella, probably *Brucella suis*, from both blood and sternal marrow. With the other patients, evidence in support of the diagnosis was available in varying degree. The clinical history may have been of a recent onset of fever with no significant previous illness. In some cases

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a later test showed an alteration in the agglutination titre. In almost all the cases the serum was tested also against *Salmonella typhosa*, *Salmonella paratyphi*, *Salmonella schottmülleri*, *Proteus* OX19, *Proteus* OXK, *Rickettsia* (*Coxiella*) *burneti*, and the local species of Leptospira, and no significant agglutination was found. In some of our

TABLE I.

Cases of Brucellosis.

Case Number.	Sex.	Age. (Yrs.)	Locality.	Occupation and Comment.	Date of Onset of Symptoms.	Type and Duration of Fever.	Serum Agglutination.			Further Notes.
							Date.	Day of Illness.	Reciprocal of Titre.	
I	M.	32	Brisbane.	Meat worker; on beef casings.	11. 6.36[1]	Mild, intermittent. 6 weeks.	14. 7.36 27. 7.36 21.10.37	34[1] 47[1] 498[1]	640 640 160	
II	M.	40	Brisbane.	Meat worker; skinned bullock heads and removed tongues.	2. 3.39	Remittent. Maximum temperature 101·6° F. 12 days.	31. 3.39	30	1280	
III	M.	14	Proston.	Dairy farm hand; shot a sick cow three weeks before illness began.	1. 8.41[1]	Moderately high, sustained. 9 weeks.	7.10.41	68[1]	1280	Sulphanilamide given.
IV	M.	48	Brisbane.	Commercial traveller; travelled widely throughout Queensland.	6.12.41[1]		19.12.41	14[1]	2560	
V	M.	38	Mareeba.	Butcher at bacon factory.	18. 8.42	Remittent. Maximum temperature 103° F. 14 days.	12. 9.42	26	2560	No relapse.
VI	M.	20	Brisbane.	Meat worker; boner (beef and pork) and on beef casings.	21.10.43	Very mild. 5 days.	3.11.43	14	640+	
VII	M.	49	Kingaroy.	Dairy farmer; handled aborting cows 5 months before, opened up dead pigs 4 months before.	9.12.43[1]	Two bouts each lasting about 9 days with 13 days' interval. Maximum temperature 103·6° F.	4. 1.44	27[1]	1280	Sulphanilamide given. Short convalescence and complete recovery.
VIII	M.	—	Atherton.	Soldier; his work did not bring him into contact with cattle.	17. 4.44	7+ days.	10. 5.44	24	160	No relapse.
IX	M.	42	Brisbane.	Pig slaughterman.	13. 4.44	Intermittent and remittent. Maximum temperature 101·6° F. 37+ days.	15. 5.44	33	640	Still febrile on discharge from hospital. Returned to work in a few weeks.
X	M.	50	Brisbane.		19. 7.44[1]		2. 8.44	15[1]	640	
XI	M.	28	Brisbane.	Veterinary officer; frequently examined and bled cattle and pigs with brucellosis.	25.10.44	Mild, intermittent; 14 days (approximately).	31.10.44 9.11.44	7 16	200+[3] 160	Sulphadiazine given. No subsequent ill effects.
XII	M.	30	Brisbane.	Meat inspector; inspected cattle, calves, sheep, pigs.	1. 3.45[1]	Intermittent, gradually subsiding. Maximum temperature 101° F.; 45 days (approximately).	10. 5.45	71[1]	320	
XIII	M.	35	Beaudesert.	Dairy farmer; had no abortions among his cows.	8.11.45	10 days, followed by short relapse.	27.12.45	50	1280	
XIV	M.	—					6.11.46		320	
XV	M.	31	Brisbane.	Clergyman; no association with animals, did not drink raw milk.	14.10.46	Intermittent for 8 weeks. Occasional evening pyrexia for 6 months thereafter. See charts.	9.11.46 16.11.46 7. 5.47	27 34 206	2560 5120 500[3]	
XVI	M.	—	Brisbane.	Oxywelder.	3. 5.47		13. 5.47	11	160	
XVII	M.	37	Brisbane.	Barman.	Before 29. 1.47	Recurrent. One day of fever each fortnight.	29. 7.47	180+	320	
XVIII	M.	65	Theebine.	Dairy farmer; does not drink milk; had no abortions among his cows or illness in his pigs.	6. 8.47[1]	Recurrent and undulant. See chart.	29. 9.47 7.10.47	55[1] 63[1]	640 640	Satisfactory convalescence.
XIX	F.	18	Dalby.	Farmer's daughter.			15.12.47 13. 1.48 28.12.47		80 160 80	
XX	F.	25	Dalby.	Farmer's wife.						
XXI	M.	37	Brisbane.	Bank official; kept two cows in 1945.	Indefinite 1945 or 1948	14 days (approximately).	5.10.48 15.10.48		80 640	Three previous, similar attacks annually.
XXII	M.	28	Tully. (Recently from Europe.)	Sawmill hand.	Indefinite 1946 or 1948	Occasional slight evening pyrexia.	22. 4.49 24. 5.49		160 160	
XXIII	M.	31	Gympie.	Forestry worker (tractor driver) and dairy hand.	4. 9.49	Evening pyrexia off and on for 7 weeks.	22. 9.49 3.10.49 13.10.49 16.12.49	19 30 40 104	640 1280 1280 160	*Brucella* (probably *suis*) cultured from sternal marrow. "Chloromycetin" given.
XXIV	M.	33	Rockhampton.	Meat inspector; inspected cattle and pigs.	March, 1948[1]	Recurrent and undulant. Maximum temperature 102·8° F. Many months.	19.11.48 29.11.48 10. 3.49 19. 4.49 24. 8.49	249[1] 259[1] 360[1] 400[1] 527[1]	500 1000 1000 1000 1000	Sulphadiazine given. Agglutination tests carried out in Commonwealth Health Laboratory, Rockhampton.
XXV	M.	36	Brisbane.	Meatworker; slicer, beef and pork.	9.10.49[1]	Mild, intermittent; 6 weeks.	14.11.49 18.11.49 30.11.49 19.12.49	37[1] 41[1] 53[1] 72[1]	2560 2560 320 640	"Chloromycetin" given. Agglutination tests carried out in Brisbane Hospital Laboratory.

[1] Approximate. [2] Test carried out at the Animal Health Laboratory. [3] Test carried out at Greenslopes Hospital Laboratory.

cases, however, there was little or nothing to indicate whether the agglutination represented active or latent infection.

Epidemiology.

Thirteen of the patients resided in Brisbane. Eleven came from various rural localities ranging from Mareeba in the north to Beaudesert in the south, and from as far west as Dalby.

The ages (Table II) varied from fourteen to sixty-five years, the emphasis being on the fourth decade.

TABLE II.
Age and Sex of Patients with Brucellosis.

Age. (Years.)	Male.	Female.
10 to 19	1	1
20 to 29	3	1
30 to 39	10	—
40 to 49	4	—
50 to 59	1	—
60 to 69	1	—
Unrecorded ..	3	—
Total ..	23	2

Occupation in Relation to Infection.

The occupations of the patients are summarized in Table III. Meat workers, meat inspectors and dairy farmers predominated; this fact emphasizes that infection is most frequently derived from association with infected animals. Sometimes there was a history of a significant incident. A farmer handled some aborting cows five months before he became ill. A farm boy was in contact with a cow suffering from weakness, refusal to eat and loss of weight; he shot it three weeks before his own illness began.

The veterinary officer was engaged, *inter alia*, in investigating brucellosis in cattle and pigs, and frequently examined infected herds and bled them for testing. Many authors have commented on the high incidence of brucellosis among veterinarians, particularly those engaged in obstetric practice. In Denmark, for instance, Thomsen (1931) found that of 65 veterinary surgeons in rural practice for more than one year, 61 showed serological evidence of brucellosis. The infection was latent in most cases, only an occasional subject having frank undulant fever.

The only two females among the 25 patients lived on farms. (The type of farming carried out was not recorded.)

There follows in Table III a varied group of patients —and how these became infected is not evident from a bald statement of their present occupations. With regard to most of them casual contact with animals or their products cannot be excluded. The bank official used to keep two cows, which he occasionally milked, three years before the present illness. Perhaps some patients became infected by ingesting raw milk or cream. The sawmill hand, for instance, used to drink raw milk freely. The soldier's work did not bring him in contact with cattle. In the case of the clergyman, careful inquiry disclosed no remembered association with animals or drinking of raw milk.

The Species of Brucella.

It is important to know the relative responsibility of the three species of Brucella in causing human infection so that preventive measures may be more accurately directed. Unfortunately the causative organism was isolated in only one case in our series, so that we can offer little direct evidence of their relative roles in Queensland. There is, however, some indirect evidence.

Brucella melitensis may be excluded. There is no record in the Australian literature of an indigenous case of infection with *Brucella melitensis* in man or animal, or of brucellosis among those associated with goats. To verify the latter point a *questionnaire* was sent to medical practitioners in the north and west of Queensland where goats abound and goat's milk is commonly used. Of 18 practitioners who replied, one reported a case in which brucellosis was suspected. A goatherd, who also drank raw goat's milk, suffered from a fever of at least twenty-eight days' duration accompanied by fluctuating jaundice. There were no other significant signs or symptoms. However, the serum, taken late in the illness, failed to agglutinate *Brucella abortus* or the other test organisms, and therefore a diagnosis of brucellosis could not be sustained.

TABLE III.
Occupations of Patients with Brucellosis.

Type of Patient.	Number.
Meat workers:	
With cattle .. 2	
With pigs .. 2	6
With both animals 2	
Meat inspectors	2
Dairy farmers or farm hands (one was also a tractor driver)	5
Veterinary officer	1
Domestic workers—farmer's wife, farmer's daughter	2
Various—commercial traveller, soldier, clergyman, oxywelder, barman, bank official, sawmill hand	7
Unrecorded	2
Total	25

Another practitioner recollected an undiagnosed case of pyrexia. The other 16 stated that there was no evidence of brucellosis or fevers of obscure nature among goatherds of drinkers of goat's milk. Thus Dr. E. L. Thomas:

> I lived 25 years in the area stretching from Burketown to Boulia and in this area goats are the main source of milk supply for general use, but I have never noticed any sickness which could be associated with them.

And Dr. H. W. Harbison of Blackall:

> Goats are essential out here, particularly for the children, and play a good role in the health of the West of Queensland, which is excellent. In more than 15 years' experience I have never seen any trouble from goat's milk, if one excepts the usual wrong mixtures of modified milk given to infants.

Dr. Harbison's enthusiasm for goats is, however, somewhat qualified. He adds:

> Goats eat my vegetables, etc., and in drought time get on the roofs of the cars to nibble leaves from trees. I don't think there is any sin they do not commit—except spread disease.

It has been generally believed (Evans, 1947) that *Brucella abortus* does not infect pigs, and therefore that a brucellar infection of pigs must be due (in the absence of *Brucella melitensis*) to *Brucella suis*. However, McCullough *et alii* (1949) have shown by the isolation of eight strains of *Brucella abortus* from pigs that the older belief is incorrect. Perhaps a probability remains that infection in pigs is usually due to *Brucella suis*, in which case *Brucella suis* would be the likely cause of the infection of our two pig butchers (Cases V and IX). These, added to Case XXIII, make at least three in our series in which the probable infecting agent was *Brucella suis*.

On the other hand, there is no doubt that *Brucella suis*, like *Brucella melitensis*, may infect cattle and be present in raw cow's milk. Evans (1947) points out that human infection due to the ingestion of such milk is more apt to occur in groups, whereas human infections with *Brucella abortus* tend to be sporadic. An exception was the Maryland epidemic of 1944, in which 28 cases were traced to a milk supply infected with *Brucella abortus* (Steele and Hastings, 1948).

In our Queensland series, the only cases associated together in time and place are those of the two females

from Dalby, about whom no further information is available. Otherwise the sporadic occurrence would be in accord with *Brucella abortus* infection. But *Brucella suis* may have been the infecting agent of some of the dairy farmers, who usually keep pigs, and of the meat inspectors, who examine carcasses of pigs as well as cattle and sheep.

The endeavour to decide on circumstantial evidence whether *Brucella abortus* or *Brucella suis* has been responsible for an infection lands one in a confusion of probabilities, and the only sound method of assessing their relative responsibilities in the various Australian States is to isolate the strains of Brucella and identify them specifically. Indeed, Richards emphasized this in 1937.

It may be noted that in some American States—Minnesota, Wisconsin, Michigan—*Brucella abortus* predominates as a cause of human brucellosis, whereas in Iowa *Brucella suis* predominates (Magoffin *et alii*, 1949).

Transmission of Infection to Man.

The epidemiology of human brucellosis is complex. There are three main animal sources of infection—goat, cow and pig (sheep, horse and dog are of less importance). There is variation in invasiveness and pathogenicity among the three species of Brucella and also among different strains of the same species. The number of organisms available for transmission in diseased tissues and body fluids may vary widely. There is a choice of routes of entry—by ingestion, through the skin, perhaps through the conjunctiva or by inhalation, rarely by blood transfusion. The duration of survival of Brucella in meat and dairy products and on contaminated ground must be considered as well as the resistance of the human subject to infection.

Ingestion of milk and milk products is the classical mode of transmission, and it should be noted that while goat's milk may contain *Brucella melitensis*, cow's milk may contain *Brucella melitensis*, *Brucella suis* or *Brucella abortus*. Spink (1948) quotes three epidemics caused by the ingestion of cow's milk contaminated with *Brucella suis*. *Brucella abortus* is less invasive than the other species, and some have doubted its pathogenicity by ingestion. But many sporadic cases and at least one epidemic have been established as due to its ingestion in milk. When *Brucella abortus* is present in milk it is usually in comparatively small numbers, whereas after a cow has aborted it is present in vast numbers in the vaginal discharges. On this ground is explainable the much higher incidence of *Brucella abortus* infection among those handling cattle than among those consuming milk.

It has been pointed out that when ingestion of milk is the mode of infection, the sex incidence is approximately equal, whereas in most series of cases there is a high male predominance. In the present series, if the 14 patients brought occupationally into contact with pigs and cattle are excluded, there is still a high male predominance in the remainder.

Mr. A. K. Sutherland, B.V.Sc., M.S., Senior Veterinary Pathologist at the Animal Health Station, Yeerongpilly, Queensland, has pointed out to me an important difference between brucellar infection in cattle and pigs. The cattle tissues liable to be infected—uterus, mammæ and supramammary lymph nodes—are not used for human consumption; but in pigs infection is much more widespread, involving, for instance, the lymph nodes of any region. Therefore, infection of the housewife from handling fresh pork is a possibility, as also is infection from the eating of undercooked pork. This may well be the explanation of some otherwise inexplicable cases. The eating of raw "hamburger" was the suggested mode of infection in one Minnesota case.

We have heard of two stock inspectors who accidentally inoculated themselves while inoculating calves with the living *Brucella abortus* vaccine—Strain 19. One inoculation was into the thumb, the other into the thigh. In each case, local inflammation developed, which subsided in due course. There were some accompanying general symptoms. One patient was found to have an agglutination titre of 1:1000, but whether or not this was due to the inoculation is impossible to say.

Prevention.

As brucellosis is primarily a disease of domestic animals, it is to the veterinary services that we look for its control. They are actively engaged in combating it.

Until it is eradicated, milk and cream should be pasteurized or boiled, and rigid inspection of meat maintained at abattoirs. These measures will largely protect the general public; but unfortunately there are no dependable methods of immunization available to protect those who are in direct contact with infected animals.

As regards caprine brucellosis, the all-important line of defence in Australia is the Quarantine Department. In view of the disastrous results which have followed the entry of infected goats into the United States, it is important that no goat or other animal infected with *Brucella melitensis* gain entry into Australia.

Clinical Features.

There is great variation in the symptoms due to brucellosis and in the duration of the illness. There are all degrees, from severe, prolonged or recurrent pyrexia accompanied by considerable disability to latent infection without any symptoms at all.

It was often impossible to define accurately the date of onset of the illness, although in Table I an attempt has been made to do so. The onset may have been insidious or its date obscured by atypical symptoms doubtfully referable to brucellosis.

In Figure I the chart shows the characteristics that inspired the name "undulant fever".

This patient, a dairy farmer, aged sixty-five years, gave a history of two previous undulations of about ten and seven days' duration, separated by afebrile periods, in the eight weeks since the illness first began. There were no subsequent relapses.

In Case XV the patient was a clergyman, aged thirty-one years, and the course of the fever was more even. The charts (Figures II and III) show no striking undulations, but a protracted fever subsiding reluctantly. The evening temperature was occasionally elevated even after eight months. Recovery of health was slow; he was easily fatigued, shivered, and sweated profusely.

Other patients have shown a mild, persistent type of fever such as that illustrated in Figure III, without a previous phase of high fever. On the other hand, the patient in Case III had an illness similar in duration and severity to the first phase of the illness in Case XV, but he then made a straightforward recovery and seven weeks after defervescence felt very well. In eleven weeks his weight loss of 26 pounds had been restored.

In Table IV are set out the frequency of the main symptoms and signs in 12 of our cases in which fairly full clinical notes were available.

Common symptoms were malaise, which varied in degree from lassitude to exhaustion, headache, sweating (especially at night) and shivering. The last two are to be expected when the diurnal range of temperature is wide. Also to be correlated with this is the experience of many patients who felt relatively well in the mornings and became ill in the afternoons. Loss of weight was common and might be considerable. Generalized aches and pains, anorexia and coated tongue were frequently found. The spleen was sometimes palpable, especially in the illnesses of longer duration. Other symptoms occasionally mentioned were slight cough, insomnia, foul breath, abdominal pain or tenderness, sore throat, constipation and enlargement of lymph nodes.

In Case XXIV the patient, aged thirty-three years, had been employed as a meat inspector for ten years. About March, 1948, he began to feel "off colour", with gradual loss of energy and appetite. There were recurring attacks, becoming each time more pronounced, with symptoms like abortive influenza. He carried on with his work until September, by which time his weight had decreased from 177 to 164 pounds. Then came a more severe attack of fever accompanied by aching and excessive sweating which confined him to bed for four days. He then for the first time sought medical attention (Dr. D. N. Bottcher), and after investigation the diagnosis of undulant fever was established by agglutination tests carried out at the

Commonwealth Health Laboratory, Rockhampton, by Dr. K. C. Porter. He was in hospital for seventeen days from November 17, during which time his temperature was normal. At other times there was fever of undulating type, the temperature reaching 38·9° C. (102° F.). When it was high there were night sweats, insomnia and irritability. A course of penicillin and sulphadiazine treatment was unsuccessful. His weight fell further to 147 pounds at the end of the year. He was four months away from work.

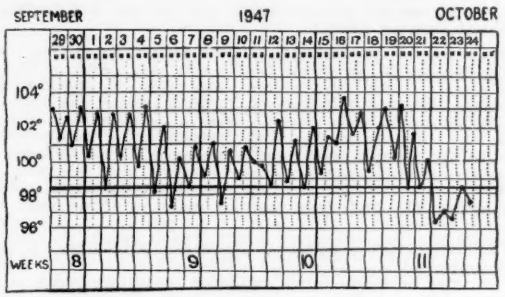

FIGURE I.

Case XVIII. "Undulant fever." There were two previous undulations, but no subsequent relapse.

His health gradually returned and his weight is now normal (September, 1949), but he still has mild attacks of fever. During recent attacks his right eye has become inflamed and painful. One sympathizes with his description of undulant fever as a "depressing complaint".

In contrast with these protracted illnesses were cases in which the illness was short and recovery prompt.

In Case XI the patient, a veterinary surgeon, aged twenty-eight years, became ill on October 25 with lumbar pains, lassitude and fever. The symptoms became gradually worse for the next eight days. There were headaches and heavy night sweating. The temperature rose from about midday, remained high until midnight or shortly thereafter, then fell, and the patient felt reasonably well again until midday. He was away from duty only from November 2 to November 8. Considerable weight was lost. There was some weakness for a week or two after he returned to work, but there were no subsequent ill effects. The total duration of the illness was less than a month.

In some of the cases in this series the histories were quite atypical, and it is questionable to what extent the symptoms were due to brucellosis.

That latent infection with brucellosis occurs is shown by the result of a survey of meat-workers carried out by us in 1937. Of 77 examined, the serum of five showed agglutination to a titre of 1:80, and that of three others to 1:40. Of these eight, three gave no history of fever.

Diagnosis.

There is a general dissatisfaction with the standards of diagnosis of brucellosis. It is likely that many cases remain unrecognized.

The occurrence of a prolonged, undulating or intermittent type of fever in meat worker, dairy farmer or veterinarian will at once suggest its possibility. But

TABLE IV.

Frequency of Main Symptoms and Signs in Twelve Cases of Brucellosis.

Sign or Symptom.	Recorded as Present.	Recorded as Not Present.	No Note.
Fever	12	0	0
Sweats	12	0	0
Malaise	11	1	0
Headache	10	0	2
Shivering	8	0	4
Loss of weight	7	0	5
Aches and pains generally	7	2	3
Anorexia	6	1	5
Coated tongue	5	1	6
Slight cough	5	0	7
Insomnia	4	0	8
Palpable spleen	3	5	4

if the symptoms are indefinite, as they often are, and the patient's occupation gives no lead, difficulties will arise. These are well exemplified by the personal experience of Alice Evans (1947). A pioneer in the bacteriology of brucellar infection in the United States of America, she became infected in 1922 while working with cultures of *Brucella melitensis*.

> For the first nine months the disease was mild. Medical aid was sought, and after examinations failed to reveal any cause for complaint, a diagnosis of "neurasthenia" was received. Then came an acute exacerbation of typical "undulant fever", so diagnosed when a culture of brucella was obtained from the blood. Then five years of poor health, with complete incapacitation much of the time. Again, medical aid was sought in four successive hospitals. The outcome was always the same, the patient was regarded as "neurasthenic". Finally the impasse was broken by the intervention of another disease which necessitated an operation, during which brucellar lesions were found, from which B. *melitensis* was cultivated. Thus accidentally, at last, came relief from the misunderstandings which must inevitably arise when a patient is said to be suffering from imaginary ills. These misunderstandings are a feature of chronic brucellosis that tries the patient almost beyond endurance.

As the clinician has his difficulties of diagnosis, so also has the pathologist his. If his stock strain of *Brucella* has become rough, it may fail to agglutinate with a patient's serum, but may agglutinate non-specifically with normal serum. Antigens prepared from different strains differ in sensitivity. The presence of

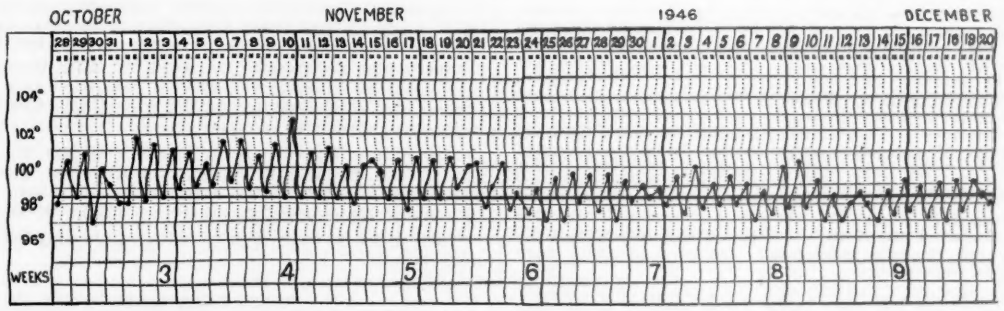

FIGURE II.

Case XV. Brucellosis with protracted course. Fever mostly intermittent in type.

anti-brucellar agglutinins may be due to vaccination against cholera (Eisele *et alii*, 1947) or to a previous or latent infection with Brucella unrelated to the present illness. Fortunately all three species of Brucella cross-agglutinate, so that the diagnostic laboratory needs to maintain only one stock strain.

Further difficulties attend the isolation of Brucella from the patient. Its culture requires special provisions. Dr. Singer has pointed out to me that, with a chronic illness such as brucellosis, culture of the bone marrow is much more likely to be successful than culture of the blood; another adjuvant is the addition of trypsin to the medium to destroy bactericidal substances which may be in the serum, and which are particularly active when blood is clotting. (Five to ten mils of 2·5%

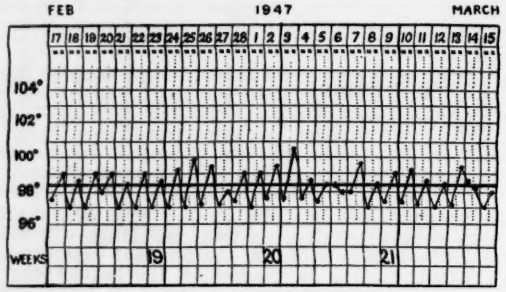

FIGURE III.
Case XV. Chronic brucellosis five months after onset. Evening pyrexia.

solution of trypsin which has been sterilized by filtration are added to 100 mils of medium.) Formulæ of suitable media are given in the text-books, and it would be a convenience to the practitioner to have a rubber-capped bottle of medium available which could, at the bedside, be inoculated with blood through the cap and dispatched to the laboratory. If *Brucella abortus* is sought, an atmosphere of 5% to 10% carbon dioxide is required.

A strain of Brucella having been isolated, it is best sent to an expert for identification of the species, as this is no easy task. Hoyer (1949) finds the urease activity another useful specific test.

Treatment.

In the treatment of brucellosis, "Chloromycetin" (Walley and Cooper, 1949; Woodward *et alii*, 1949) and aureomycin (Bryer *et alii*, 1949) have superseded other drugs. Herrell and Barber (1949) advocate a combination of aureomycin and dihydrostreptomycin. Eisele (1949) considers the drugs in use are often, or usually, only suppressive, and that a high relapse rate is to be anticipated.

Two patients in this series were treated with "Chloromycetin".

In Case XXIII the patient, a tractor driver, aged thirty-two years, under the care of Dr. N. B. Wilmer and Dr. A. Murphy, was probably infected on the dairy farm at which he assisted during week-ends. He had had occasional attacks of headache and vomiting for a year. The present illness, which began on September 4, 1949, was associated with a mild, periodic, intermittent fever, headaches and general weakness. There was a weight loss of 14 pounds. The results of successive agglutination tests are recorded in Table I. A Brucella, probably *Brucella suis*, was grown by Dr. E. Singer on culture from the patient's blood on October 13, and from the sternal marrow on October 18. (It was slightly rough, did not require carbon dioxide for growth, behaved atypically towards dyes, and was serologically not *Brucella melitensis*.) On each of these days the patient was afebrile.

Treatment with "Chloromycetin" was begun on November 2 and continued for eight days. The amount given was 1·5 grammes at the first dose, 1·5 grammes three hours later, thereafter 0·25 gramme every three hours, making a total dosage of 18·25 grammes. The patient was discharged from hospital on November 15.

In evaluating the effect of the therapy, it is to be noted that the patient was not severely ill when treatment was begun. His temperature had then been normal for eight days, and while at rest in bed he had no complaints except conjunctivitis. There was weakness on exertion. When he returned for reexamination five weeks after the treatment, he reported that he was well and happily at work. He had regained five pounds in weight. On December 16 no organism was grown on culture from his sternal marrow. Dr. N. B. Wilmer further reports (August 11, 1950) that the patient has remained perfectly well since, his appetite is good, his weight has increased and he has had no headaches or evening pyrexia.

In Case XXV the patient, a meat worker, aged thirty-six years, became ill on about October 9, 1949, with anorexia, generalized pains, feverishness and loss of weight (14 pounds). He was admitted to hospital under the care of Dr. H. Johnson. His pyrexia was of a mild intermittent type, and the temperature had returned to normal three days before specific treatment was begun. The spleen was palpable. Agglutination tests resulted as recorded in Table I. Attempted culture of Brucella from blood (November 21) and from sternal marrow (November 23) was unsuccessful.

"Chloromycetin" treatment began on November 25 and was continued for nine days at intervals of three hours. The first two doses were of three grammes each, subsequent doses of 0·25 gramme, a total of 23·75 grammes being given. In three days he was very much better.

During convalescence his weight increased slowly and had almost returned to normal when he resumed work in March, 1950. There has been no recurrence of illness to the present time (October 24, 1950).

Summary and Conclusions.

Twenty-five cases of brucellosis, occurring in Queensland over a period of fourteen years, are reported. Diagnosis was made by the agglutination test, confirmed in one case by the isolation of a strain of Brucella, probably *Brucella suis*.

Twenty-three patients were male, two female.

Thirteen of the patients—meat workers, meat inspectors, dairy farmers, veterinary officer—were associated occupationally with cattle or pigs or both. Such association offers a much higher risk of brucellar infection in Queensland than the ingestion of milk.

The general opinion that *Brucella melitensis* is not present in Australia is supported by the absence of evidence of brucellosis among goatherds or drinkers of goat's milk in Queensland. Strict surveillance by the Quarantine Department of the importation of goats and sheep must be maintained to prevent its entry.

Brucella suis was the probable infecting agent in at least three of our cases. The role of *Brucella suis* in human brucellosis in Queensland needs further investigation, as this species is common in Queensland pigs, and is credited with greater invasiveness for man than *Brucella abortus*.

To clarify the epidemiology, it is desirable that endeavours be continued to isolate and identify the species of Brucella responsible for human infections. A correlated need is for further study and effort to improve the standards of diagnosis, which presents difficulties to both clinician and pathologist. A practical step towards this end would be to make available to practitioners a rubber-capped bottle containing suitable medium which could be inoculated at the bedside.

The main symptoms in our cases were pyrexia, sweats and shivers, malaise, headache, loss of weight, generalized pains and anorexia. The illness might be short, or prolonged for many months. Infection might be latent.

Two patients were treated with "Chloromycetin" with good results.

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SOME VETERINARY ASPECTS OF THE PREVENTION OF BRUCELLOSIS.[1]

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HUMAN BRUCELLOSIS rarely if ever arises from other human subjects or from carriers, infection being derived usually from diseased animals. Derrick and Brown (1950) have pointed out that there is no evidence that brucellosis exists among goats in Australia, and *Brucella melitensis* has not been identified in this country; so we have only *Brucella abortus* and *Brucella suis* to deal with. Cattle and swine are therefore the important reservoirs, although horses, dogs and other animals are also occasionally infected.

It is hoped that, besides drawing attention to the occurrence of brucellosis in man in Australia, the paper by Derrick and Brown will stimulate interest in the isolation and specific identification of strains from human subjects, because such information is needed as a guide to the probable sources of infection.

Huddleson (1943) makes the following statement:

> . . . in the United States the incidence of recognised brucellosis in man tends to vary directly with the extent of the hog raising industry. . . . With the known wide distribution and high prevalence of Brucella infection of cattle the low incidence of clinical brucellosis has been striking. It has been noted that there is a higher rate of human infections in areas raising large numbers of hogs and goats.

It is generally considered that *Brucella suis* is more pathogenic to man than is *Brucella abortus*. Meyer and Eddie (1941) reported that of 74 cases of brucellosis among laboratory workers, the causal organisms isolated in 34 of these were as follows: *Brucella suis* 12 cases, *Brucella abortus* one case, *Brucella melitensis* 21 cases. The frequency of *Brucella suis* infections is rather striking because laboratory workers are exposed more often to *Brucella abortus* during the preparation of antigen for agglutination tests. Many laboratories which formerly used *Brucella suis* antigen for testing swine serum now use *Brucella abortus* antigen in order to reduce the risk to their staffs.

On the other hand, there is an unexplained predominance of *Brucella abortus* infections in man in certain American States having large swine populations heavily infected with brucellosis. It is clear, then, that local data will need to be collected to assess the relative importance of cattle and pigs as sources of human infections in Australia. Of course, the identification of the species responsible for a human infection does not definitely establish the source, because *Brucella suis* occasionally infects cattle and *Brucella abortus* has been found in swine.

Brucella abortus or *Brucella suis* may infect man by ingestion or through mucous membranes or intact or minutely abraded skin. The importance of the respiratory route of infection was indicated by Elberg and Henderson (1948), who showed that guinea-pigs were highly susceptible to infection by inhalation of *Brucella suis* and *Brucella melitensis*.

There are two possible approaches to the prevention of human brucellosis. The first is to prevent or minimize human exposure to infectious material. The second is to eradicate the disease from the principal hosts—cattle and swine. It is these two points that I propose to discuss. However, it should first be noted that quite apart from its relation to disease in man, brucellosis is of prime importance to veterinarians in most parts of the world because it causes enormous economic loss in the dairy and pig industries.

Bovine Brucellosis.

Brucellosis is prevalent among cattle wherever highly developed dairy industries exist. Among beef cattle the disease is uncommon because they are usually in less close contact. It would be difficult to estimate the number of infected cows or infected herds in Australia. As an indication, however, it may be said that over the last four years an average of 17,000 blood samples *per annum* were submitted to the agglutination test by the Queensland Department of Agriculture and Stock, and about 10% to 15% of them gave positive results.

Financial loss amounting to several million pounds *per annum* is sustained by the Australian dairy industry through abortions, neonatal mortality, sterility and reduced milk production due to brucellosis.

The organism is usually confined to the reproductive organs and mammary glands and their associated lymph nodes. Infection is permanent in 80% to 90% of cows. The initial infection is usually followed by abortion, but the subsequent calf is aborted in only about 25% of cases.

Diagnosis of brucellosis in cattle is made largely on the agglutination test. The test used in our laboratory is based on the work of Seddon (1915, 1919). Three tubes containing 0·25, 0·15 and 0·1 millilitre of a one in 10 dilution of serum are used, and 1·5 millilitres of standard *Brucella abortus* antigen, issued by the Commonwealth

[1] Read at a combined meeting of the Section of Pathology, Bacteriology, Biochemistry and Experimental Medicine and the Section of Public Health, Tuberculosis, Tropical Medicine and Industrial Medicine, Australasian Medical Congress (British Medical Association), Seventh Session, Brisbane, May-June, 1950.

Serum Laboratory, are added to each tube. Definite agglutination in the third tube is regarded as a positive result.

The chief sources of infectious material are the fœtal fluids and the placenta, and the uterine discharge, in which infection persists for some weeks after abortion or premature calving. Brucellæ are excreted in the milk more or less constantly, so that most samples of raw bulked milk are infected. However, Wilson (1942) has pointed out that *Brucella abortus* is present in only small numbers in milk, whereas enormous numbers of organisms are present in the vaginal discharges.

The fact that raw market milk so often contains *Brucella abortus* and yet appears to cause so few human infections is worth comment. Perhaps the disease is often not recognized in patients whose occupation does not suggest brucellosis. Or perhaps man is a poor host for *Brucella abortus* and is not readily infected through the alimentary tract, especially if the organism is ingested in small doses. However, when *Brucella suis* infections occur among cows supplying raw milk, an outbreak of human brucellosis can be expected.

Fortunately, efficient pasteurization of milk and cream destroys brucellæ. Wilson (1942) states that not a single case of human brucellosis attributable to pasteurized milk or cream has been recorded.

There is little risk that brucellosis will be contracted from beef, because the organism is usually confined to the reproductive organs and mammary glands and their associated lymph nodes. Routine slaughtering practice is to remove the genitalia and the udder intact and then discard them.

Control of Bovine Brucellosis.

Present knowledge of bovine brucellosis is sufficient to permit eradication of the disease by carefully organized campaigns based on the slaughter of cows reacting to the agglutination test. The disease has been eradicated in this way from much of Denmark and from parts of the United States of America and Tasmania, but in most parts of the world eradication has not been commenced. The disease is so prevalent that the number of cows that would have to be sold at beef prices represents a loss which the dairy industry could not bear without financial aid from the State. Furthermore, there are probably not enough veterinarians available in Australia to carry out the enormous amount of testing and regulatory work which would be required.

At present most farmers allow the disease to run its own course, and some of them sell for slaughter cows that abort or are sterile. Under these circumstances a herd suffers periodic epizootics interspersed with periods of several years' quiescence.

In Europe and the United States of America the disease has been limited to some extent in some herds by the provision of special maternity stalls in which all cows calve. The stalls are rigidly disinfected after each parturition. This procedure is not applicable in Australia because our cows are not housed at any time of the year.

In recent years control of bovine brucellosis has been greatly facilitated by the use of *Brucella abortus* Strain 19 vaccine, developed by the United States Department of Agriculture. Efforts to produce in cattle serviceable immunity with dead vaccines have been unsuccessful. Some workers have used vaccines containing fully virulent, live organisms, but such vaccines have always been prohibited in Australia because of the risk of spreading disease and of causing cows to excrete virulent organisms in their milk. Strain 19 is a strain of low virulence. It induces useful resistance, but the organism does not become established in the body, and there is no evidence that it can cause abortion or set up an infection transmissible from one animal to another. A disadvantage of Strain 19 vaccine is that it must be inoculated in the fully virulent, live state; hence it must be handled with skill and care.

For a variety of reasons, which need not be discussed here, accepted veterinary practice is to vaccinate at four to eight months of age all heifer calves raised in a herd. Experimental and field observations show that Strain 19 vaccination is the most effective and practicable method for reducing the incidence of abortion and suppressing brucellosis in dairy herds (Buddle, 1949). In Queensland, the Department of Agriculture and Stock vaccinated 10,547 calves in 1947-1948 and 19,127 in 1948-1949. Use of the vaccine is being expanded as fast as available manpower permits. In New Zealand and Victoria over half the heifer calves born each year are now being vaccinated.

Vaccination alone will not eradicate brucellosis. Nevertheless, the aim is to promote the use of Strain 19 vaccine so that five or ten years hence the majority of herds will be composed entirely of vaccinated animals. When that stage is reached the incidence of infection should have been reduced to a level low enough to make eradication by "test and slaughter" economically feasible and within the capacity of available veterinary manpower.

Swine Brucellosis.

Precise knowledge of swine brucellosis came later (1914) than knowledge of bovine brucellosis. Much confusion has come from considering the swine disease as analogous to the bovine disease instead of considering them as separate but related entities.

Although bovine brucellosis is prevalent in Great Britain, swine brucellosis is apparently absent. The disease occurs in swine in other parts of Europe and is common in the United States of America. It is of special interest to note that swine brucellosis spread into Denmark in the 1920's, but as a result of determined efforts by farmers and veterinarians, it was eradicated from that country by 1932.

Brucella suis was first identified in swine in Australia by King (1934) working in New South Wales, and the organism has since been identified in Victoria and Queensland. However, brucellosis is not so widely distributed among swine in Australia as it is in cattle. Tasmania, South Australia and Western Australia are considered to be free of swine brucellosis. Only two infected herds have been found in Victoria; the disease was eradicated from these and there is no evidence that it now exists in that State (Albiston, Pullar and Talbot, 1949). In New South Wales the disease is prevalent in the counties of Cumberland and Picton and is said to occur only occasionally in other parts of the State. In Queensland the disease is present in all the swine-raising areas (Sutherland, 1950).

There are certain differences between *Brucella suis* infection of swine and *Brucella abortus* infection of cattle which have a bearing on the epidemiology of human brucellosis. In swine, brucellosis affects principally the reproductive organs, causing abortion or infertility; but chronic arthritis and osteomyelitis also occur, and the organism is often found in lymph nodes throughout the body. Thus, in contrast to cattle, carcasses of infected swine are a likely source of human infections.

Swine excrete *Brucella suis* not only at the time of abortion or parturition, but at all times in the urine, so that the environment of an infected herd is apt to be heavily contaminated. This danger is offset to some extent so far as man is concerned by the fact that swine are handled much less than dairy cows.

Diagnosis is based largely on the agglutination test, the same technique and the same *Brucella abortus* antigen being used as for bovine serum. Unfortunately the test has certain deficiencies when applied to swine, but no better diagnostic method is available. Some infected swine give a positive reaction for only a few weeks or months after exposure to infection, notwithstanding the fact that the organism persists in their bodies. For this reason the test and slaughter method of eradicating brucellosis from herds of cattle is modified to make it applicable to swine. All pigs that have had contact with positive reactors are regarded as infected and are either culled or isolated. The progeny of sows and boars not reacting to the agglutination test are then selected and reared in isolation as replacements for the whole of the existing breeding stock. The prolificacy of swine makes it possible to achieve this in a year or so. It is, of course, essential that a high

standard of sanitation be maintained, and that the agglutination test be applied frequently to make certain that the clean replacement stock is not infected.

No satisfactory method of immunizing swine against brucellosis has been found. In fact, it seems that recovery from natural infection induces but poor immunity.

Eradication of swine brucellosis has received little encouragement in some quarters, largely because of difficulties arising from the fact that the agglutination test does not detect all the infected animals. However, it is now known that, notwithstanding this difficulty, it is possible to eradicate the disease by concentrating on raising a young, disease-free replacement herd. In Queensland the Department of Agriculture and Stock is attempting to control the disease along these lines.

Summary.

Human brucellosis is not transmitted from man to man, and brucellosis of goats is not known in Australia, so that cattle and swine are the reservoirs from which human infections are derived.

Local data on the species of Brucella causing human infections are needed as a guide to the probable sources of infection.

Brucellosis is prevalent among dairy cows throughout Australia. Pasteurization destroys brucellæ in milk, but even raw milk seems to cause surprisingly few *Brucella abortus* infections. However, when *Brucella suis* occurs in a raw milk supply human infections can be expected.

Brucellosis is so prevalent among dairy cattle that the expenditure of much money and manpower would be needed for eradication. It is hoped that extensive use of *Brucella abortus* Strain 19 vaccine will reduce the incidence of the disease to the level where eradication by the "test and slaughter" method is feasible.

Swine are considered a more important source of human brucellosis than are cattle. Swine brucellosis occurs in New South Wales and Queensland, but not in the other Australian States.

Infected swine excrete *Brucella suis* more or less constantly in the urine. Further, the organism is found in lymph nodes throughout the body, so that the handling of infected pork may cause human infection.

Because its distribution is limited, and because of its public health importance, eradication of swine brucellosis is being attempted in Queensland. The agglutination test is used to identify groups of infected swine, and attention is concentrated on raising the young replacement stock free of disease by testing and sanitation.

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THE INCIDENCE OF TUBERCULOUS INFECTION. REPORT OF AN EPIDEMIOLOGICAL SURVEY OF THE AUSTRALIAN CAPITAL TERRITORY AND QUEANBEYAN.

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IN January, 1949, the Commonwealth Department of Health decided to conduct a survey to discover the incidence of tuberculous infection in the Australian Capital Territory and the adjacent town of Queanbeyan. This was to be part of an Australia-wide programme to eradicate tuberculosis.

Canberra (the only large town in the Australian Capital Territory) and Queanbeyan together form a more or less isolated geographical unit with no town of any size within a thirty-mile radius. In America, community surveys are recognized as being a valuable means of eradicating tuberculosis. Davies and Sherer (1939) have made the following statement:

> In addition to the collection of scientific data such surveys are of immediate practical importance. They permit the discovery and isolation of all foci of tuberculous infection in the community. They uncover early cases of disease that may be treated while their prognosis is still good. They identify cases of inactive disease that should be checked for evidence of activity. It is doubtful whether any other method will fulfil the same functions to the same degree.

The population of the Australian Capital Territory, according to the census of June, 1947, was 16,905 persons. Of these, 15,156 were in the city area (Canberra), 1389 in the rural districts and 360 at Jervis Bay—a separate unit on the south coast of New South Wales. Queanbeyan, which is just over the boundary line of the Australian Capital Territory, is eight miles from Canberra and has a population of approximately 6000. Owing to the acute housing shortage in Canberra, many persons working in the Australian Capital Territory reside in Queanbeyan, and there is considerable intermingling of the population of the two towns. As Queanbeyan is in the State of New South Wales, the permission of the State Department of Public Health was required to extend the survey to Queanbeyan; this was readily obtained.

At first a complete community survey was not envisaged, and plans were made to perform tuberculin tests only on persons aged under twenty-five years, and to examine the positive reactors radiologically at the Canberra Community Hospital. The home contacts of positive reactors were to be visited by a qualified nurse and invited to submit to a skin test or X-ray examination or both. By this means it was hoped to trace some of the infectious persons in the community.

For various reasons this plan was modified, and it was decided to include all age groups in the tuberculin testing. Unfortunately, as the result of some preliminary propaganda, the idea that tuberculin testing was only for those aged under twenty-five years had become prevalent, proved hard to eradicate, and lost us many volunteers in the age group over twenty-five years.

The decision to extend the tuberculin survey to cover the higher age groups was made for three main reasons. Firstly, many aged over twenty-five years wished to know why they were excluded, and it was realized that some means of covering the higher age groups would have to be found. Secondly, as we proceeded with tuberculin testing of the under twenty-five years age group, it became apparent that the percentage of positive reactors was very low, and it seemed feasible to continue with our policy of skin testing first, and radiologically examining only the positive reactors. Finally, many of the young working people of Canberra live in hostels and boarding houses, and if we were to follow up all their contacts we should automatically have to test a percentage of the over twenty-five years population.

This decision to perform tuberculin tests on persons aged over twenty-five years rather than screen them by mass miniature radiography receives authoritative American

support. Chavés (1949) stated that "both Pinner and Rich have indicated the need for large periodic tuberculin surveys of apparently healthy people of all ages, including those over forty".

Propaganda.

As this survey was a voluntary one, it was realized that publicity through several channels would be necessary to bring it to the notice of the general public. Hedberg (1945) states that "large groups of adults require a great deal more selling to accept a tuberculin test than an X-ray examination".

Information about the survey was spread through the local Press of Canberra and Queanbeyan, through posters, radio announcements and individual letters, which were distributed in schools, mothercraft centres, offices and workshops two weeks before these were visited. These letters had a detachable slip which was filled in by those wishing to be tested.

Our publicity by American standards was unspectacular, and it is assumed that many additional volunteers might have been gained by more and better publicity. As the majority of persons who did not respond seemed to do so from indifference and not from fear of consequences, a more active campaign designed to warn persons who feel well and are therefore indifferent might have brought more recruits. It was found that the extension of the survey to include members of Parliament had good publicity value.

Methods of Tuberculin Testing Employed.

For children aged under five years the Vollmer patch test was used, in accordance with the views of Colebatch (1941):

> The Vollmer patch test is a satisfactory method of tuberculin testing in children. The patch test makes tuberculin testing a simple innocuous procedure and reliably discovers all cases worth singling out for isolation, treatment and observation.

In view of reports from England by Paterson (1944) and Deane (1946) that the tuberculin jelly patch test (Allen and Hanburys) was more reliable than the Vollmer patch test, that there was no severe reaction, and that the jelly was cheap and kept indefinitely, we decided to use the two tests on a group of children aged 0 to four years in order to compare results under Australian conditions.

The Vollmer patch and the jelly were applied to the back between the shoulder blades after the skin had been cleaned with acetone and lightly rubbed with fine sandpaper. The jelly was then applied in the form of a "V" about three-quarters of an inch high and covered with adhesive plaster[1] extending well beyond the jelly. All Vollmer patches used were fresh and obtained from the Commonwealth Serum Laboratories. Both patches were left in place for forty-eight hours, instructions being given not to wash the child's back during the period, and the results were read in seventy-two or ninety-six hours—that is, twenty-four or forty-eight hours after removal of the patch.

[1] "Faczo" waterproof adhesive plaster was found to be satisfactory.

Comparative Results of Vollmer Patch and Tuberculin Jelly Patch Tests.

This survey included 1418 pre-school children aged between three months and five years, residing in the Australian Capital Territory or at Queanbeyan. Of these, the first 1015 received both the Vollmer patch test and the tuberculin jelly patch test. Of these 1015 children, 1009 gave no reaction to either test. Six children gave a positive reaction to the jelly test, but only two of these also gave positive results to the Vollmer patch test. In our very small experience the jelly test proved more sensitive that the patch test (see Table I).

The tuberculin jelly test was found to be both economical and simple.[1] Vollmer patches cost 1s. 4d. each wholesale and are thus four times as expensive as tuberculin jelly (patch tests).

Primary School Children.

Primary school children, whose ages for the most part ranged from five to eleven years, were used as a test group to compare the efficiency of the Mantoux intradermal test and the tuberculin jelly patch test. The tuberculin jelly patch was applied (as described previously) between the shoulder blades and bathing was prohibited for two days —a popular embargo. For the Mantoux test, old tuberculin obtained freshly diluted from the Commonwealth Serum Laboratories was used, 0·1 millilitre of a one in 1000 dilution being injected intradermally. The results were read in forty-eight and seventy-two hours.

Reactions to the Mantoux test were classified as follows: a "+" reaction consists of an area of swelling 5 to 10 millimetres in diameter, a "++" reaction consists of an area of swelling 10 to 20 millimetres in diameter, a "+++" reaction consists of an area of swelling over 20 millimetres in diameter, and a "++++" reaction consists of an area of swelling exceeding 20 millimetres in diameter with vesiculation or central necrosis.

Results obtained with the intracutaneous tuberculin test and the tuberculin jelly patch test are compared in Table II. As there was no significant difference in tuberculin reactions between boys and girls at this age, males and females are grouped together.

A total of 2294 children received both the Mantoux intracutaneous test and the tuberculin jelly patch test. Of these, 2226 failed to react to both tests, and 68 gave a positive reaction to the Mantoux test of whom 49 also gave a positive reaction to the jelly test. As can be seen from Table II, the Mantoux and tuberculin jelly tests gave comparable results in the earlier age groups, and when the reaction to the Mantoux test was "++" or greater. More than half the children aged nine years or more giving a "+" reaction to the Mantoux test would have been

[1] One five-gramme tube contains enough jelly for 70 to 75 tests and costs 23s. 8d. in Australia.

TABLE I.

Comparative Results of Vollmer Patch and Tuberculin Jelly Patch Tests of 1015 Children, Aged 0 to 4 Years.

Age.	Males.			Females.			Total Number Tested.
	"VP-negative"[1] "JT-negative".	"VP-positive" "JT-positive".	"VP-negative" "JT-positive".	"VP-negative" "JT-negative".	"VP-positive" "JT-positive".	"VP-negative" "JT-positive".	
3 to 12 months	119	—	1	101	—	—	221
1 year	107	1	—	126	—	1	235
2 years	107	—	—	104	—	—	211
3 years	99	—	2	92	1	—	194
4 years	70	—	—	84	—	—	154
0 to 4 years ..	502	1	3	507	1	1	1015

[1] "VP" = Vollmer patch test; "JT" = tuberculin jelly patch test.

TABLE II.

Comparative Results of Mantoux and Tuberculin Jelly Patch Tests on Group of 2,294 Children Aged 5 to 11 Years Inclusive.

Age of Child. (Years.)	MT[1]: − JT: −	MT: +	JT: +	MT: ++	JT: +	MT: +++	JT: +	Total Number Tested.
5	322	2	(2)	2	(2)			326
6	330	3	(2)	3	(3)			336
7	382	4	(2)	6	(6)			392
8	335	5	(2)	4	(4)	1	(1)	345
9	326	2	(0)	7	(6)	2	(2)	337
10	300	7	(3)	5	(5)	1	(1)	313
11	231	8	(3)	4	(4)	2	(1)	245
Total ..	2226	31	(14)	31	(30)	6	(5)	2294

[1] "MT" = Mantoux test 0·1 millilitre of 1 in 1000 old tuberculin; "JT" = tuberculin patch test.

classified as "tuberculin-negative" if only the tuberculin jelly test had been used. There was no instance of a child's reacting to the tuberculin jelly patch test and not to the Mantoux test. Those children receiving either a Mantoux test or a jelly test only have been excluded from Table II.

Colebatch (1941), in discussing the disadvantages of the Mantoux intracutaneous test in children, makes the following statement:

> A judicious psychological approach to the patient is essential with a nurse or other assistant to hold the younger children. This is particularly so in carrying out mass surveys of children in some of whom fear of the needle may precipitate hysterical outbursts.

With a very few exceptions, we found that school children from five upwards tolerated the Mantoux test well, and that very rarely a nurse or an assistant was required to hold the child. It was found best to ensure that the children were not "queued up" watching others receive their injection, but this simple precaution was all that was necessary. Thus it would seem that, as more reacted to the Mantoux test than to the tuberculin jelly test, the former is still the method of choice and cannot be replaced by any simpler method, except perhaps in the examination of children up to the age of eight years, in which group the tuberculin jelly test proved almost as sensitive as the Mantoux intracutaneous test.

Results of Survey.

The total number of persons covered by the survey was 12,874 out of an estimated population of the Australian Capital Territory and Queanbeyan of approximately 24,000.

Of this number, 514 were attached to military, naval and air-force establishments in the Australian Capital Territory. Their chests were radiographically examined with a mobile X-ray machine taking 35-millimetre X-ray photographs, but they were not tuberculin tested. No case of pulmonary tuberculosis was found in this group.

The remaining 12,360 persons received a preliminary tuberculin test, followed by radiographic examination of the chests of positive reactors. In Table III are set out the results of the tuberculin tests of these 12,360 persons analysed with regard to sex and age. As can be seen from Table III and Figure I, the percentage of positive reactors aged under twenty years is very small and approximately the same for males and females.

For both males and females there is a sudden sharp rise in the incidence of tuberculous infection (as revealed by the Mantoux test) in the age groups fifteen to nineteen and twenty to twenty-four years and again between twenty and twenty-four and twenty-five and thirty-nine years. This increased incidence of infection is more pronounced among males than among females, and in all later age groups males show a significantly higher rate of tuberculous infection.

Comparison of Results of Tuberculin Tests of Persons Residing in the Australian Capital Territory and at Queanbeyan.

In Tables IV and V the results of tuberculin tests of persons residing in the Australian Capital Territory and Queanbeyan respectively are tabulated separately, and in Figure II these results are compared. Copied on to this graph are curves obtained by Anderson (1940) from a sample of 5822 apparently healthy persons in the Sydney area in 1938 and Kerr (1949) of 7682 persons in Bendigo in 1948.

As the survey was conducted on a voluntary basis, the results are not entirely satisfactory for statistical analysis, in which random sampling of the population in the two areas would be necessary to obtain a representative group of the populations concerned.

However, if we remember this limitation and apply the χ^2 test to the results obtained for the population of Canberra and Queanbeyan, the higher rate of tuberculous

TABLE III.

Results of Tuberculin Tests of 12,360 Persons Residing in Australian Capital Territory and Queanbeyan.

Age Group—Years (Inclusive).	Males.			Females.			Total Number of Reactors, Male and Female.	Total Number of Persons Tested, Male and Female.	Percentage of Reactors.
	Number Reacting.	Number Not Reacting.	Percentage of Reactors.	Number Reacting.	Number Not Reacting.	Percentage of Reactors.			
0 to 4 ..	8	703	1·1	5	702	0·7	13	1418	0·9
5 to 9 ..	25	1034	2·4	24	985	2·4	49	2068	2·4
10 to 14 ..	53	790	6·3	47	790	5·6	100	1680	5·9
15 to 19 ..	58	474	10·9	61	542	10·1	119	1135	10·5
20 to 24 ..	234	531	30·6	145	537	21·3	379	1447	26·2
25 to 29 ..	284	354	44·5	211	335	38·6	495	484	41·8
30 to 34 ..	272	229	54·3	163	287	36·2	435	951	45·7
35 to 39 ..	341	164	67·5	181	187	49·2	522	873	59·8
40 to 44 ..	212	88	70·7	104	117	47·1	316	521	60·7
45 to 49 ..	203	82	71·2	85	62	57·8	288	432	66·7
50 to 54 ..	180	43	80·7	45	50	47·4	225	318	70·8
55 to 59 ..	99	39	71·7	24	31	43·6	123	193	63·7
60 to 64 ..	45	24	65·2	18	15	54·5	63	102	61·8
65 and over ..	15	6	71·4	8	9	47·1	23	38	60·5
Totals ..	2029	4561	—	1121	4649	—	3150	12,360	—

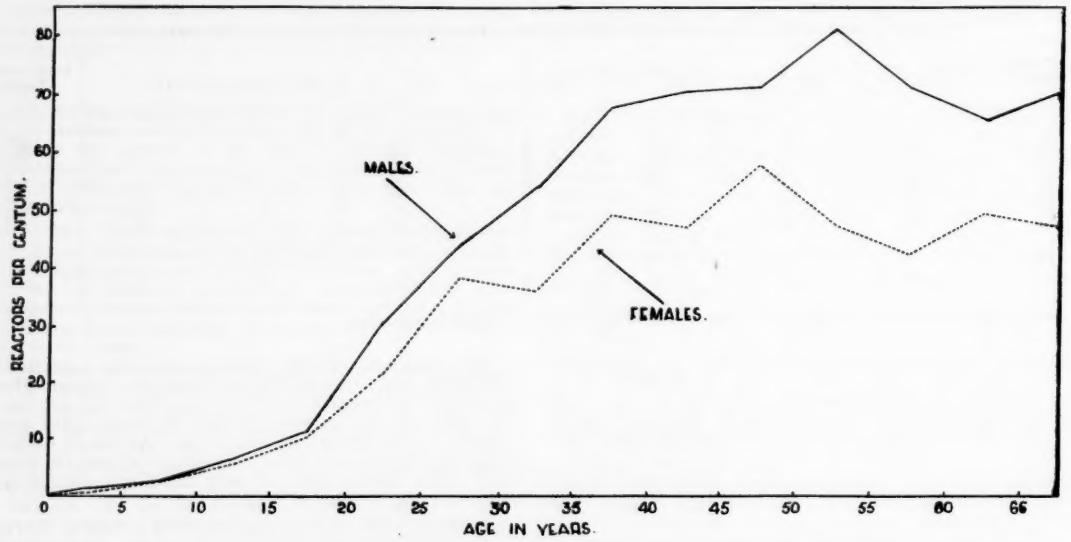

FIGURE I.

Results of tuberculin tests of 12,360 persons residing in the Australian Capital Territory and Queanbeyan. Percentage of positive reactors distributed according to age and sex.

infection in Canberra is statistically significant for males in the age groups twenty to twenty-four and twenty-five to twenty-nine years and for females in the age groups twenty to twenty-four, thirty to thirty-four, thirty-five to thirty-nine and forty-five to forty-nine years (Table VI).

This difference in the rates of tuberculous infection between Canberra and Queanbeyan can probably be explained by the fact that the adult population of Canberra is, to a certain extent, a floating population drawn principally from the capital cities of Australia, whereas the population of Queanbeyan is more static, being that of an old-established country town. Hence the rate of tuberculous infection in Canberra, really a country town in size and situation, is greater in the higher age groups than that found in an established country town, Queanbeyan, but less than that found by Anderson in a capital city (Sydney, 1938). Rates of tuberculous infection of pre-school and school children in Canberra and Queanbeyan are the same and very much lower than those found by Anderson for children in the Sydney area in 1938, but closely parallel to those found by Kerr in Bendigo in 1948.

A rather surprising result is that the rate of tuberculous infection of Canberra adults closely parallels that found by Kerr for a selected industrial group in Bendigo in 1948. Bendigo has a high tuberculosis mortality rate (50 per 100,000 *per annum*), whereas Canberra over the ten-year period 1938 to 1947 had the low average tuberculosis mortality rate of 12·9 per 100,000.

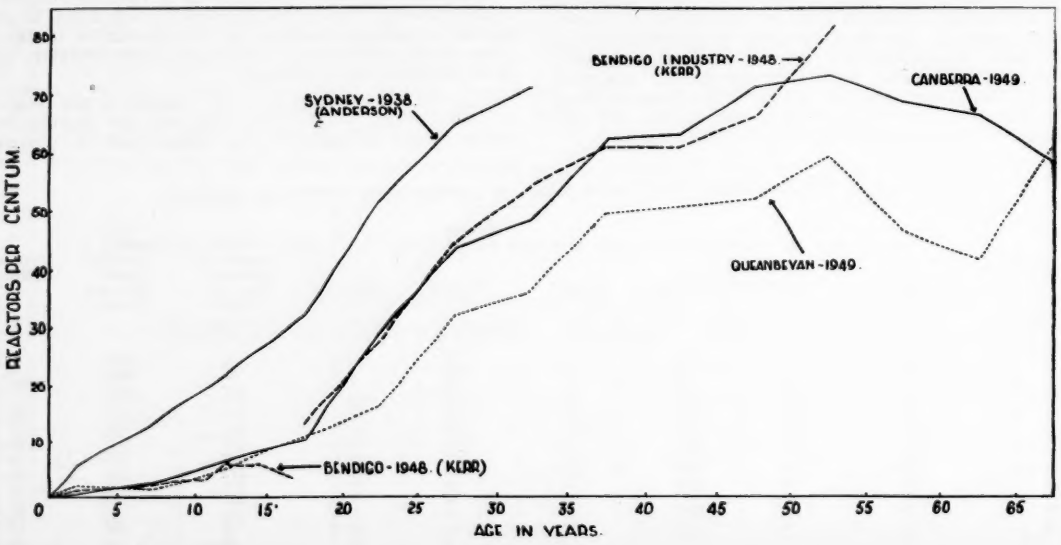

FIGURE II.

Comparison of the extent of tuberculous infection of the population of Canberra and Queanbeyan (1949) with that prevailing in Bendigo (1948—Kerr, 1949) and in Sydney (1938—Anderson, 1940).

TABLE IV.

Results of Tuberculin Tests of 9723 Persons Living in the Australian Capital Territory. Distribution According to Age, Size and Sex of Reaction.

Age Groups—Years (Inclusive).	Males. Mantoux Test.[1] Result. +	++	+++	++++	Total Number "Mantoux-positive".	Number "Mantoux-negative".	Percentage "Mantoux-positive".	Females. Mantoux Test.[1] Result. +	++	+++	++++	Total Number "Mantoux-positive".	Number "Mantoux-negative".	Percentage "Mantoux-positive".	Total Number "Mantoux-positive", Male and Female.	Total Number of Subjects.	Percentage "Mantoux-positive".
0 to 4 ..	5	—	—	—	5	585	0·9	4	—	—	—	4	600	0·7	9	1194	0·8
5 to 9 ..	8	11	1	—	20	767	2·5	11	10	1	—	22	743	2·9	42	1152	2·7
10 to 14 ..	19	14	2	—	35	579	5·7	15	17	8	—	40	571	6·5	75	1225	6·1
15 to 19 ..	12	21	10	1	44	375	10·5	14	18	12	1	45	395	10·2	89	859	10·4
20 to 24 ..	54	91	54	11	210	439	32·4	22	50	53	4	129	416	23·7	339	1194	28·4
25 to 29 ..	64	91	81	17	253	288	46·8	25	77	59	15	176	262	40·2	429	979	43·8
30 to 34 ..	44	77	96	16	233	190	55·1	22	61	42	11	136	210	39·3	369	769	48·0
35 to 39 ..	62	95	92	34	283	131	60·8	21	56	44	29	150	129	53·8	433	693	62·5
40 to 44 ..	26	61	65	31	183	71	72·0	15	24	26	14	79	81	49·4	262	414	63·3
45 to 49 ..	26	52	53	31	172	61	73·8	16	21	21	6	64	35	64·6	236	332	71·1
50 to 54 ..	18	52	63	29	162	37	81·4	6	13	9	3	31	34	47·7	193	264	73·1
55 to 59 ..	13	25	27	22	87	31	73·7	4	5	4	2	15	15	50·0	102	148	68·9
60 to 64 ..	11	16	10	4	41	18	69·5	6	5	2	1	14	10	58·3	55	83	66·3
65 and over	1	4	3	—	8	2	80·0	—	—	1	1	2	5	28·6	10	17	58·8
Totals	—	—	—	—	1736	3574	—	—	—	—	—	907	3506	—	2643	9723	—

[1] 0·1 millilitre of one in 1000 old tuberculin.

Results of Radiography in Children.

A full-size X-ray photograph was taken of every child with a positive tuberculin reaction, either at the Canberra Community Hospital or on a mobile X-ray machine on loan from the army. Although many children showed radiological signs of healed calcified primary tuberculosis (tuberculous foci), in only two cases was there any suspicion of an active lesion.

CASE I.—L.O. was a pre-school girl, aged three years; she reacted to the tuberculin jelly test and the Vollmer patch test. Her father was a known sufferer from chronic pulmonary tuberculosis. The mother stated that the child had had a persistent cough for some months, but was otherwise well. Her radiograph on June 25, 1949, showed an area of opacity at the base of the upper lobe of the right lung connected to the hilum by streaky opacities. The right hilar glands were enlarged. Follow-up X-ray photographs were taken every month, and as resolution was slow she was admitted to the Canberra Community Hospital in September for a six weeks' course of streptomycin (0·25 gramme twice daily). This was well tolerated, and her last X-ray photograph on January 9, 1950, showed evidence of resolution since July, 1949, with calcification proceeding in the region of the right hilum.

CASE II.—J.K., a female child, was aged nine years. A Mantoux test produced a "+++" positive result, and the result of a jelly patch test was positive. An aunt had died of tuberculosis seven years previously, but it was stated that the patient had had no contact with this aunt. A sister, aged twelve years, has a calcified primary complex in the lower zone of her right lung. An X-ray photograph on April 29, 1949, revealed a small, round, partly calcified focus at the level of the third left intercostal space, with several small areas of calcification in the left hilar region. There was also a collection of tiny partly calcified opaque areas under the anterior end of the second left rib and in the second left intercostal space. Seven months later (November 11) an X-ray photograph revealed a hazy opaque area above the right hilum. She was admitted to the Canberra Community Hospital in November, 1949, for bed rest. A report on a radiograph on January 19, 1950, was: "Appearances in left lung as before. Some resolution of small areas of infiltration previously present in right upper lobe."

Follow-Up of Contacts of Children Reacting to Tuberculin.

There were 187 children giving positive reactions to tuberculin tests in the school and pre-school groups, and it was hoped that a check on their home contacts might reveal the source of infection and discover some undiagnosed cases of tuberculosis.

The homes of all but 16 of these children were visited, the 16 omissions being due to the facts that four families had left the district soon after the children were tested,

TABLE V.

Results of Tuberculin Tests of 2637 Persons Living in Queanbeyan. Distribution According to Age, Sex and Size of Reaction.

Age Group—Years (Inclusive).	Number Tuberculin Tested, Male and Female.	Males. Mantoux Test Results. +	++	+++	++++	Total Number "Positive".	Total Number "Negative".	Percentage "Positive".	Females. Mantoux Test Results. +	++	+++	++++	Total Number "Positive".	Total Number "Negative".	Percentage "Positive".	Percentage of Total "Positive", Male and Female.
0 to 4 ..	224	3	—	—	—	3	118	2·5	1	—	—	—	1	102	1·0	1·8
5 to 9 ..	516	1	3	1	—	5	267	1·8	—	1	—	1	2	242	0·8	1·4
10 to 14 ..	455	6	9	2	1	18	211	7·9	2	2	3	—	7	219	3·1	5·5
15 to 19 ..	276	5	3	6	—	14	99	12·4	4	7	4	1	16	147	9·8	10·9
20 to 24 ..	253	7	12	5	—	24	92	20·7	6	5	4	1	16	121	11·7	15·8
25 to 29 ..	205	6	15	9	1	31	66	32·0	6	15	13	1	35	73	32·4	32·2
30 to 34 ..	182	6	24	6	3	39	39	50·0	5	10	12	—	27	77	26·0	36·3
35 to 39 ..	180	7	30	17	4	58	33	63·7	4	14	10	3	31	58	34·8	49·4
40 to 44 ..	107	9	15	5	—	29	17	63·0	5	11	9	—	25	36	41·0	50·5
45 to 49 ..	100	2	17	9	3	31	21	59·6	2	11	6	2	21	27	43·8	52·0
50 to 54 ..	54	5	4	5	4	18	6	75·0	1	8	4	1	14	16	46·7	59·3
55 to 59 ..	45	3	8	1	—	12	8	60·0	3	4	1	1	9	16	36·0	46·7
60 to 64 ..	19	—	3	1	—	4	6	40·0	1	1	2	—	4	5	44·0	42·1
65 and over	21	2	2	3	—	7	4	63·6	2	4	—	—	6	4	60·0	61·9
Total	2637	—	—	—	—	293	987	—	—	—	—	—	214	1143	—	—

and that the other 12 children's homes were at a considerable distance from Canberra—the children were boarders at two private schools in Canberra.

For 103 of the remaining 171 reacting children whose families were interviewed and investigated, no contact with a person suffering from active tuberculosis could be traced. Twenty of these 103 children had only recently arrived in Australia, being emigrants from the United Kingdom and other European countries, where the incidence of tuberculous infection among children is considerably higher than in Australia.

TABLE VI.

Results of χ^2 Test, Canberra and Queanbeyan Tuberculin Surveys.[1]

Age Groups. (Years.)	Males.		Females.	
	χ^2.	Result.	χ^2.	Result.
0 to 4	1·160[3]	N[3]	0·0026	N
5 to 9 ..	0·422	N	3·226	N
10 to 14 ..	1·319	N	3·714	N
15 to 19 ..	0·325	N	0·023	N
20 to 24 ..	6·847	S[4]	9·243	S
25 to 29 ..	7·682	S	2·076	N
30 to 34 ..	0·550	N	5·979	S
35 to 39 ..	0·547	N	10·020	S
40 to 44 ..	2·506	N	1·114	N
45 to 49 ..	4·127	? S[5]	5·692	S
50 to 54 ..	0·285	N	0·008	N
55 to 59 ..	0·841	N	1·076	N
60 to 64 ..	2·107[2]	N	0·103[2]	N
65 and over ..	1·723[2]	N	0·615[2]	N

[1] The customary limit beyond which a value of χ^2 is considered to indicate a significant difference between the hypothetical and observed values in the sample is $\chi^2=3·841$ ($P=0·05$ with $N=1$).

[2] Based on Yates's modification of the χ^2 test.

[3] "N"=not significant.

[4] "S"=significant.

[5] "? S"=doubtful significance.

Fifty-four of the reacting children had been in close contact with known subjects of tuberculosis, some of them with the same subject. A grandmother, who has subsequently died of tuberculosis, was the probable source of infection of two young children, and all four children of a mother who died of tuberculosis in 1947 gave a positive response to the tuberculin test. In addition, ten other reacting children had a history of contact with a probable subject of tuberculosis.

The remaining four children from three families had no history of contact with a known sufferer from tuberculosis, but in each case the mother of the family was shown to be suffering from active tuberculosis.

CASE III.—P.M., a Canberra housewife, was aged thirty-two years. Her two sons, aged seven and three years, gave positive results to tuberculin tests. She had a history of feeling tired and lethargic after the birth of her second son. An X-ray examination on April 7, 1949, revealed a soft mottled opaque area at the apex of the left lung extending down to the second anterior rib shadow, with a pronounced drainage pedicle to the left hilus. There were dense linear markings deep to the first right rib shadow. Three specimens of fasting gastric contents were submitted for microscopic examination and culture on April 14, 15 and 16, 1949. On May 23 all cultures were reported as yielding a growth of *Mycobacterium tuberculosis*. She was then admitted to the chalet of the Canberra Community Hospital for bed rest, and was discharged in November. An X-ray photograph taken on November 15 showed continuous resolution from May, with the appearances consistent with a lesion in which fibrosis was predominant. Culture of fasting gastric contents failed to produce a growth of *Mycobacterium tuberculosis*. The patient is clinically very well and has gained two stone in weight.

CASE IV.—B.J., a Canberra housewife, aged thirty-three years, had a son, aged ten years, who reacted to the tuberculin test; a Mantoux test produced a "++" reaction. An X-ray photograph taken on March 30, 1949, revealed soft mottling in the right subapical region. Three specimens of fasting gastric contents were submitted for culture (on April 5, 6 and 7, 1949) and were reported as negative six weeks later. An X-ray photograph taken on June 17 showed unchanged appearances from those in a film taken on March 30. On September 22 probable slight clearing of the lesion at the apex of the right lung was reported, and on December 3 the opaque areas were still clearing. B.J. has a minimal active regressive tuberculous lesion, which has shown progressive improvement without active treatment.

CASE V.—W.M., a Queanbeyan housewife, aged fifty-four years, had a son, aged fourteen years, who reacted to the Mantoux test. She had a history of loss of weight, lethargy and night sweats in September and October, 1949. An X-ray photograph on February 7, 1950, showed evidence of consolidation of the apex of the right lung with a probable thick-walled cavity strongly suggestive of old fibro-caseous tuberculosis. Culture of sputum for tubercle bacilli is being attempted.

There is a considerable amount of work involved in following up contacts of children who react to tuberculin tests. Some homes have to be visited many times before anyone is found, and some people require much persuasion before they will submit the rest of the family to skin tests and X-ray examinations. Nevertheless, the follow-up of home contacts was responsible for finding three cases of unsuspected tuberculous infection, and would appear to be a valuable method of seeking undiagnosed cases of infectious tuberculosis in the community.

Results of X-Ray Examination of Adults Reacting to Tuberculin.

The tuberculosis mortality rate for the Australian Capital Territory over the ten-year period from 1938 to 1947 has averaged 12·9 per 100,000. This is a very low figure (for Australia as a whole the tuberculosis mortality rate in 1947 was 30 per 100,000); but it may not represent the true position, as in the past persons suffering from tuberculosis are known to have gone to sanatoria in parts remote from Canberra. In Canberra and Queanbeyan, as a result of tuberculin testing and X-ray examination, six adults with previously unsuspected active pulmonary tuberculosis requiring sanatorium treatment were found. These cases are detailed below.

CASE VI.—W.E., an unmarried male, aged thirty years, a returned soldier, gave a "+++" reaction to the Mantoux test. An X-ray examination on May 10, 1949, revealed soft opaque areas in the periphery of the first and second right intercostal spaces. As W.E. was entering a military hospital for treatment for another complaint, his X-ray film was forwarded to the military authorities. He was found to be suffering from active pulmonary tuberculosis.

CASE VII.—G.C.C., a married male, aged twenty-nine years, was a returned soldier. An X-ray film on June 18, 1949, revealed an opaque area with radiolucent centre and soft edges in the first right intercostal space and mottling in the second right intercostal space, suggestive of active tuberculosis with cavitation. Smears of sputum were found to contain *Mycobacterium tuberculosis*, and at the beginning of July he was admitted to the Canberra Community Hospital and later transferred to the Repatriation General Hospital, Concord.

CASE VIII.—T.E.M., a single female, aged twenty-seven years, had no symptoms. An X-ray picture on June 11, 1949, showed an opaque area measuring 2·0 by 3·5 inches in the second left intercostal space, with a dense centre surrounded by a rarefied ring, and another small dense opaque area at the apex of the right lung. The patient was investigated, and when all three specimens of the fasting gastric contents yielded a growth of *Mycobacterium tuberculosis* she was admitted to the Canberra Community Hospital on August 18. Although her clinical condition appeared excellent, in October she had a slight hæmoptysis and is now having a course of streptomycin and paraamino salicylic acid.

CASE IX.—S.R., an unmarried male, aged twenty-two years, had no symptoms. His mother and father had died of tuberculosis ten and seven years earlier respectively. An X-ray film on July 9, 1949, revealed a soft opaque area at the apex of the left lung. Speciments of sputum were found to contain *Mycobacterium tuberculosis* on July 25, and the patient was admitted to the Canberra Community Hospital for bed rest. Clinically he made good progress, and an X-ray examination taken on December 8 revealed appearances suggestive of a predominating fibrotic process. The patient was discharged to convalesce at home.

CASE X.—L.R. was a married male, aged forty-six years. An X-ray examination on August 12, 1949, revealed mottling at the apex of the left lung and in the line of the third left rib, with opaque areas at the apex of the right lung.

Specimens of sputum yielded a culture of *Mycobacterium tuberculosis* after six weeks' incubation, and the patient was admitted to the Canberra Community Hospital in October.

CASE XI.—C.P. was a married male, aged forty-six years. An X-ray examination on December 7, 1949, revealed mottled opaque areas in the upper zone of the right lung down to the level of the third rib shadow anteriorly, with similar appearances on the left side; the findings were typical of bilateral upper lobe tuberculosis with probable cavitation. Examination of smears and culture of sputum revealed the presence of *Mycobacterium tuberculosis*, and the patient was admitted to the chalet of the Canberra Community Hospital in January.

In view of the present shortage of sanatorium accommodation for tuberculosis sufferers, we were fortunate in having beds readily available in the chalet of the Canberra Community Hospital. All patients were able to be admitted without delay.

In addition to these six patients who required admission to hospital, there were four persons—a female aged nineteen years, and three males aged twenty-four, twenty-five and forty-four years respectively—who showed in their radiographs typical minimal tuberculous lesions, but who had no symptoms or signs. Their fasting gastric contents did not yield a growth of tubercle bacilli, and radiologically their lesions are stationary or have regressed without treatment.

A further 22 persons had X-ray appearances suggestive of pulmonary tuberculosis of doubtful activity. They were investigated by smear and cultural examination of three specimens of sputum, or if they had no sputum, by culture of three specimens of fasting gastric contents. In all cases negative results were obtained, and repeated X-ray films have shown no change in their lesions. Most of these persons, after further observation, will probably be classed as having inactive tuberculosis, and one or two may require treatment.

In addition to these 22 cases of doubtfully active tuberculosis, 50 persons showed calcified or dense fibrous scars typical of old inactive tuberculous lesions (not primary foci). They are being observed by serial X-ray examinations.

Four known cases of tuberculosis were investigated for signs of activity, and in two evidence of activity was found.

Incidental findings were three radiographs showing appearances typical of pneumonokoniosis (in all cases the subjects had been miners for a number of years), and one probable case of Boeck's sarcoid (this patient was referred to his private doctor for gland biopsy, after sputum tests had given negative results for *Mycobacterium tuberculosis*).

Other abnormalities found on X-ray examination included a cyst of the anterior mediastinum, aortic aneurysms, enlarged hearts and "fluffy" opaque areas of pneumonitis of uncertain origin (confirmed by "clear" X-ray findings a fortnight or a month later). Three instances of high right half of the diaphragm, several probable cases of bronchiectasis and cystic disease of the lung, and sundry metallic foreign bodies were seen. All persons in whom abnormalities were discovered were referred to the private doctors for diagnosis and treatment.

B.C.G. Vaccination.

In view of the prevailing low rate of tuberculous infection among school and pre-school children in the Australian Capital Territory and at Queanbeyan, the wholesale vaccination of "tuberculin-negative" children with B.C.G. vaccine would seem unnecessary. Consequently our attentions were confined to "tuberculin-negative" children and young adults exposed to special risk of infection. Forty-nine such persons were vaccinated with B.C.G. transported by air from the Commonwealth Serum Laboratories, Melbourne, and used the same day. Of these 49 persons, 36 have been tuberculin tested six weeks to two months after vaccination, and all have been converted to the "tuberculin-positive" state. The remaining 13 persons vaccinated left the district without being retested.

No severe reactions from B.C.G. were evident, a small papule about five millimetres in diameter which broke down transiently at the fourth or fifth week being the usual reaction.

In view of the sharp rise in the rate of tuberculous infection among young adults, it might be worth vaccinating with B.C.G. the "tuberculin-negative" members of the leaving class in local schools each year. The drawback to such a procedure is that when an epidemiological survey is repeated, as we hope this will be in a couple of years, one cannot compare results with those of the previous survey, and so one could be unable to judge to what extent the rate of tuberculous infection had been influenced by the discovery and isolation of infected persons by the previous survey. However, it has been stated in some quarters that it is possbile to differentiate between the skin reactions following natural infection and those following B.C.G. vaccination.

Cost of Survey.

Unfortunately it is not possible to present a detailed analysis of the cost of the survey, which was in the vicinity of £3000. This includes salaries for trained nurse, social worker and medical officer who comprised the survey team, the running expenses of a motor-car, the cost of X-ray examinations, tuberculin, Vollmer patches and tuberculin jelly. It also includes the cost of printed material and advertising, and small items like syringes, needles, paper bags for X-ray films, stomach tubes *et cetera*.

Summary.

During 1949 an epidemiological survey for tuberculosis was carried out in the Australian Capital Territory and at Queanbeyan; 12,874 persons were included in the survey, of whom 12,360 volunteered for tuberculin testing and 514 were examined by mass miniature radiography without preliminary tuberculin testing.

The percentage of positive reactions to tuberculin tests was very low among school and pre-school children. The rate of tuberculous infection of young adults was higher in Canberra that at Queanbeyan.

In all, ten persons were discovered to be suffering from active tuberculosis requiring sanatorium treatment; brief case histories are given.

A further 34 persons were investigated to discover the nature and activity (if any) of lesions detected by radiography.

Forty-nine persons were vaccinated with B.C.G. vaccine (Commonwealth Serum Laboratories) with conversion of tuberculin reactions in all those retested (36).

The cost of the survey was in the vicinity of £3000—that is, £300 per case of active tuberculosis discovered. As most of the patients found to require treatment had minimal lesions with a good prognosis, the expenditure would seem justified.

Conclusions.

1. An epidemiological survey of this kind is a valuable method of finding in the community and referring for treatment persons with active infectious tuberculosis.

2. A similar survey should be carried out in a year or two in order to ascertain the effectiveness or otherwise of the measures being taken to control tuberculosis in the community.

3. To repeat the survey in a year or two might help to elucidate the problem of shift in the tuberculosis mortality peak to higher age groups, particularly among males. It would give information about the incidence of active tuberculosis in older persons whose previous reaction to tuberculin was known.

4. The educational value of such a survey is difficult to assess, but would seem to be considerable. The population at large is now "tuberculosis conscious", and since the completion of the survey many requests for tuberculin tests have been received.

Acknowledgements.

I am indebted to the Director-General of the Commonwealth Department of Health for permission to publish this report, and to officers of the department for their help and cooperation. Especially I wish to thank my assistants, Sister R. Yarra and Miss M. Brophy, for their enthusiastic and untiring help, and Mr. R. Stone for doing practically the whole of the radiographic work.

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THE AUSTRALIAN LEPTOSPIROSES.[1]

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LEPTOSPIROSIS is an acute febrile disease of man and animals caused by *Leptospira icterohæmorrhagiæ* or by one of its serological variants. It is a cosmopolitan disease, but it was not until 1934, when an outbreak occurred amongst sugar-cane cutters in the cane-growing district of Ingham in north Queensland, that the disease was diagnosed in Australia (Morrissey, 1934; Cotter and Sawers, 1934).

Since then, leptospirosis has occurred in other parts of Australia, a total of 188 cases having been reported by various authors (Morrissey, 1934; Cotter and Sawers, 1934; Clayton, Derrick and Cilento, 1937; Johnson, Brown and Derrick, 1937; Johnson and Brown, 1938; Johnson, 1942; Downes, 1942; and Merton, 1949). In this paper, a further 168 cases diagnosed in this department's laboratory are included, the total being brought to 356 cases.

Five types of pathogenic leptospira are known to cause human infections in Australia. These are *Leptospira icterohæmorrhagiæ* (the cause of classical Weil's disease), *Leptospira australis* B, sometimes called *Leptospira salinem* (the cause of one type of leptospirosis in the canefields), *Leptospira australis* A (the cause of another type of leptospirosis in the canefields), *Leptospira pomona* (causing the mild pomona-type leptospirosis), and *Leptospira mitis* (causing another mild type of leptospirosis). None of these strains is indigenous to Australia, although the three last-mentioned strains were first isolated in this country. For convenience, infections with *Leptospira australis* A and *Leptospira australis* B may be grouped together and referred to as the canefields leptospiroses, because these two strains appear to be confined to sugar-cane growing districts. Likewise, infections with *Leptospira pomona* and *Leptospira mitis* are usually benign and may be termed mild leptospiroses.

EPIDEMIOLOGY OF THE AUSTRALIAN LEPTOSPIROSES

Table I shows the Australian animal reservoirs of the various types of leptospirosis.

[1] Read at a combined meeting of the Section of Pathology, Bacteriology, Biochemistry and Experimental Medicine and the Section of Public Health, Tuberculosis, Tropical Medicine and Industrial Medicine, Australasian Medical Congress (British Medical Association), Seventh Session, Brisbane, May-June, 1950.

Classical Weil's Disease.

The carrier rats are *Rattus norvegicus* and *Rattus rattus* —both imported into Australia. Infected rats excrete leptospiræ in urine, and this may contaminate water or food. Although infection usually occurs through some traumatic break in the skin, leptospiræ can also penetrate mucous membranes, such as those of the eye, nose, mouth and throat. *Rattus norvegicus* and *Rattus rattus* are essentially urban rats; consequently the majority of Australian patients who developed this disease have lived and worked in towns and cities. *Leptospira icterohæmorrhagiæ* has also been found in Australian dogs (Gray, 1942), and human cases may be expected to follow contact with infected dogs. It is rather surprising to find that only three of the 21 Australian cases have come from States other than Queensland. Medical practitioners attending for obscure febrile illnesses patients whose occupation brings them in contact with rats or dogs should keep Weil's disease in mind. Serum which does not agglutinate Proteus X19 may agglutinate *Leptospira icterohæmorrhagiæ*. *Leptospira icterohæmorrhagiæ* also occurs naturally in pigs and horses (Van Riel, 1946), so it is possible that Weil's disease may not be the somewhat rare disease that these figures indicate.

TABLE I.

Showing the Animal Reservoirs of the Australian Leptospiroses.

Clinical Type.	Serological Type.	Animal Reservoirs.
Classic Weil's disease.	*Leptospira icterohæmorrhagiæ.*	Imported rats (*Rattus norvegicus, Rattus rattus*). Dogs.
Canefields leptospiroses.	*Leptospira australis* A. *Leptospira australis* B.	Native rat (*Rattus conatus*). Imported rat (*Rattus rattus*). ? Bandicoot (*Isoodon* spp.).
Mild leptospiroses.	*Leptospira pomona. Leptospira mitis.*	Cattle, calves. Pigs. Dogs.

Canefields Leptospiroses.

There is a considerable rat population in the cane-growing districts. The principal carrier of both *Leptospira australis* A and *Leptospira australis* B is a native rat, *Rattus conatus* (formerly *culmorum*), though *Rattus rattus* and the bandicoot (*Isoodon* spp.) have been found to be infected. Carrier animals excrete leptospiræ into water or mud, or may even contaminate the standing cane plants with urine. Abrasions of the skin are common in cane cutters, and the leptospiræ probably enter through these lesions.

Mild Leptospiroses.

No rat or native animal has yet been found to be infected with *Leptospira pomona*. However, as long ago as 1939, pigs slaughtered at the Brisbane Abattoir were found to be infected with this organism. On several occasions *Leptospira pomona* has been isolated from pigs in Queensland, and about 10% of specimens of pig serum examined have contained anti-pomona agglutinins. *Leptospira pomona* has since been found to infect pigs in Switzerland (Gsell, 1945) and in Java (Collier, 1948). A fever called swineherd's disease, known to occur in Switzerland for many years, has been shown by Gsell (1944) to be pomona-type leptospirosis. According to Gsell (1945), and also to Schmid and Giovanella (1947), pigs infected with *Leptospira pomona* do not become obviously ill, but develop leptospiruria which may persist for several months. By excreting leptospiræ into water or mud, one pig can infect a whole herd. Likewise, *Leptospira mitis* is endemic in Australian pigs, and has also been found in Swiss patients who had contact with pigs (Gsell and Weismann, 1948).

Other common carriers of *Leptospira pomona* are cattle —particularly dairy cattle and calves. In recent years, a good deal of attention has been directed to bovine lepto-

spirosis (Bernkopf, 1946; Bernkopf, Olitzki and Stuczynski, 1947; Davis, 1948). *Leptospira pomona* has been isolated by Sutherland and Simmons (1949) from Queensland calves suffering from fever, hæmoglobinuria and jaundice. This condition had been known in the past under the name of "red water" of calves, but its leptospiral ætiology was not suspected. In 1939 I found anti-pomona agglutinins in the serum of calves and dairy cattle, but *Leptospira pomona* was not isolated from cattle until Sutherland and Simmons investigated "red water" of calves. There is likewise serological evidence that *Leptospira mitis* is endemic in cattle and calves, but this organism awaits isolation from these animals.

Dogs, too, can be carriers of *Leptospira pomona*. Mochtar and Collier (1939) found anti-pomona agglutinins in the serum of a dog in Java, and I obtained the same finding in 1940 in the serum of a Samoan dog. In a recent personal communication, Dr. D. T. Oxer, Veterinary Research Officer of the Commonwealth Serum Laboratories, Melbourne, has informed me that Dr. B. R. V. Forbes and he have demonstrated anti-pomona agglutinins in the serum of three Victorian dogs. Incidentally, this is the first evidence that pomona-type leptospirosis may occur in Victoria.

Animal carriers of *Leptospira pomona* and *Leptospira mitis* can transmit infection to man in two ways—either by direct contact with an infected animal (for example, butchers, veterinary surgeons, meat inspectors), or else through the medium of water or mud into which leptospiræ have been excreted. For instance, a patient with pomona-type leptospirosis at Winton, Queensland, developed his infection after bathing in a pool at which cattle and pigs drank. This occurred during a period of drought in the district. If the water is slightly alkaline, and some organic matter is present, leptospiræ can survive in water for several weeks. Leptospirosis in rural areas is much more frequent after falls of rain.

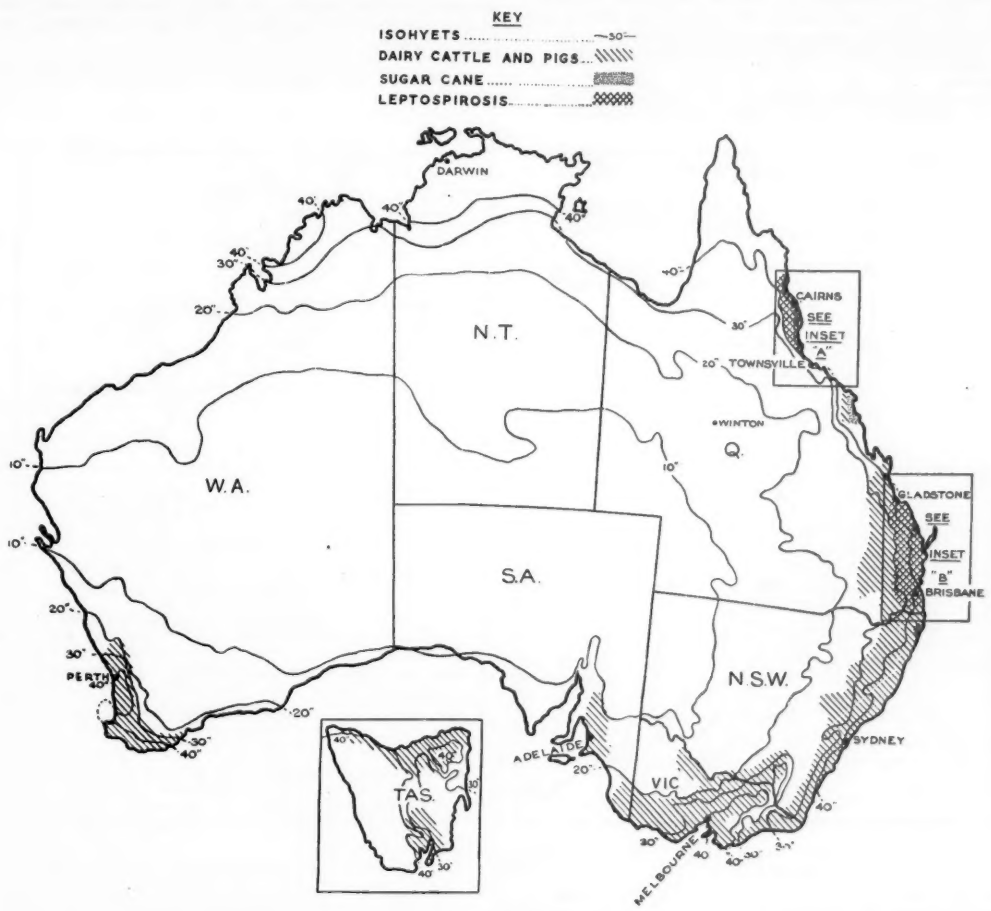

FIGURE I.

Map of Australia, showing isohyets, sugar-growing areas, distribution of dairy cattle and pigs, and known endemic areas of leptospirosis.

GEOGRAPHICAL DISTRIBUTION.

Table II shows the geographical distribution of 356 cases of leptospirosis of all five types, and the numbers in each particular locality. Patients with classical Weil's disease came from three States, patients with the cane-fields leptospiroses lived only in North Queensland, whilst patients with the mild pomona-type and mitis-type leptospiroses lived in northern Queensland, southern Queensland and northern New South Wales. Several cases of pomona-type leptospirosis from Perth are not included. Of 356 patients, no less than 342 lived in Queensland.

The map of Australia (Figure I) shows the localities in which cases have occurred. It will be seen that, at present, there are two rural zones or areas (labelled Inset A and Inset B) in which leptospirosis is endemic, and Figure II shows these areas in greater detail.

The northern endemic area (Inset A, Figure II) extends from Mossman (17° 16′ south latitude, 145° 29′ east longitude) in the north, to Ingham (18° 39′ south latitude, 146° 9′ east longitude) in the south. In the west it is bounded by the Great Dividing Range. This is a narrow strip of coastal country, devoted almost exclusively to the growing of sugar-cane; but timber-getting and dairying are lesser primary industries. It contains much scrub and rain forest; the climate is tropical and the rainfall high (up to 190 inches *per annum* in parts). In this area occur all five Australian leptospiroses.

The southern endemic zone (Inset B, Figure II) extends from Gladstone (23° 50′ south latitude, 151° 17′ east longitude) in the north to Kyogle (28° 6′ south latitude,

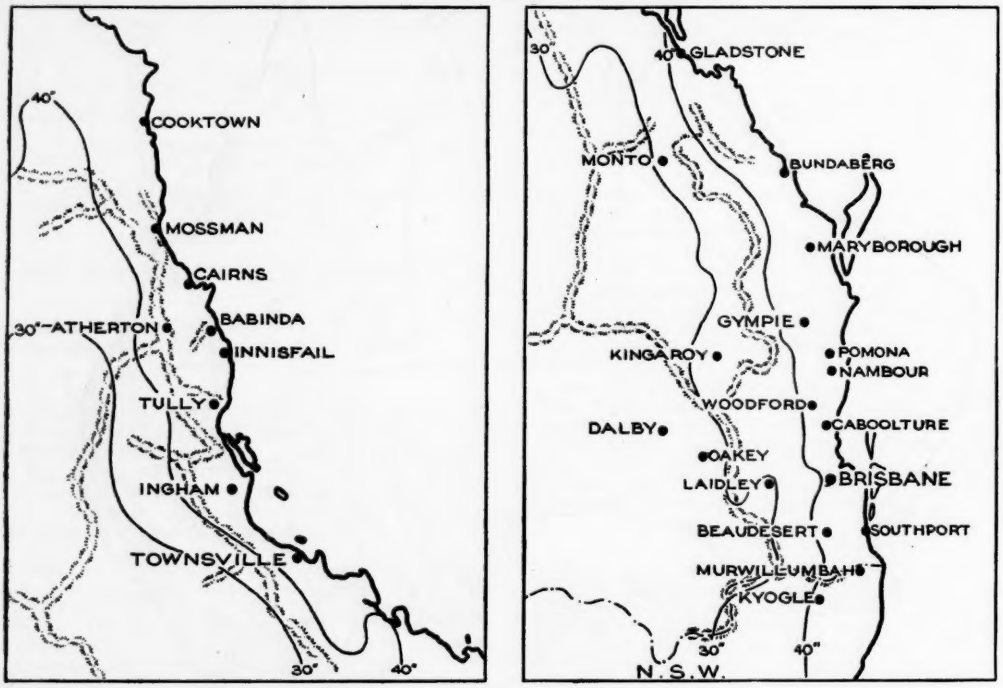

FIGURE II.

Inset A. Inset B.

153° east longitude) in the south. In the west it extends along a line drawn through Dalby (27° 11′ south latitude, 151° 16′ east longitude), Kingaroy (26° 55′ south latitude, 151° 8′ east longitude), and Monto (24° 9′ south latitude, 151° 15′ east longitude) to Gladstone. This is an undulating, coastal area, intersected with several low mountain ranges. The climate is sub-tropical, and the annual rainfall, which is heaviest in summer, exceeds 30 inches. The principal primary industries are dairy and pig farming, cattle raising and mixed farming. In this area only mitis-type and pomona-type leptospiroses have been reported.

While the canefields types of leptospiroses are not likely to extend, except to other cane-growing districts, I think it probable that ultimately the mild leptospiroses will be found to have a much wider distribution than is known at present. Figure I shows that dairy and pig farming is carried on over a large area in the eastern and southern parts of Australia, and that in general the annual rainfall in these parts exceeds 30 inches. It is likely that mild leptospiroses will be found throughout this area. Leptospirosis is by no means a tropical disease.

Occupational Incidence.

As would be expected, patients whose occupations bring them into contact with animal carriers of leptospirosis are apt to contract the disease. Table III shows the occupations followed by 187 patients who contracted leptospirosis. It will be seen that those who contracted classical Weil's disease include sewer workers, outdoor workers (often associated with primary produce), employees in hotels, cafés and fish markets, and sugar-cane cutters. Cane-cutters and outdoor workers (timber-getters, labourers, railway fettlers) are the chief victims of canefields leptospiroses, whilst workers on dairy and pig farms, butchers and other abattoir employees are apt to develop the mild leptospiroses.

Figure III portrays this occupational incidence as a histogram.

Incubation Period.

The incubation period is five to fourteen days, but is usually about a week.

CLINICAL SIGNS AND SYMPTOMS.

Classical Weil's Disease.

Good descriptions of Weil's disease are now to be found in modern text-books of medicine. In the present series of 21 cases, some clinical information is available from 15 patients. All patients were males. In nearly every case the disease had a sudden onset, with fever, headache, muscular pains, vomiting, and rapid and severe prostration. Thirteen patients developed jaundice between the third and seventh days of illness. Meningeal involvement (neck stiffness, severe headache, drowsiness or irritability) occurred in six patients, renal involvement (such as albuminuria, microscopic hæmaturia, the passage of tubular casts, dysuria, oliguria) in eight patients, pulmonary involvement (cough, congestion) in eight patients, and eye involvement (conjunctivitis or photophobia) in nine patients. In addition, two patients (aged thirty-six years and fifty-two years) developed auricular fibrillation, which is recognized as a complication of severe leptospirosis (Hume and Szekely, 1944). The duration of

fever ranged from nine to thirty-four days (average 17·3 days), and febrile relapses occurred in six patients. Early in the disease neutrophile leucocytosis was a feature, the highest count being 59,000 leucocytes per cubic millimetre. Two of the patients died, both on the eleventh day after onset.

TABLE II.
Showing Geographical Distribution of Leptospirosis in Australia According to Type.

Clinical Type.	Serological Type.	Geographical Distribution.	Number of Cases.
Weil's disease.	*Leptospira icterohæmorrhagiæ.*	Brisbane (Queensland)	11
		Sydney (New South Wales)	2
		Melbourne (Victoria)	1
		Ipswich (Queensland)	1
		North Queensland	6
			} 21
Canefields types.	*Leptospira australis* A. *Leptospira australis* B.	North Queensland only	217
Mild types.	*Leptospira pomona.* *Leptospira mitis.*	North Queensland	6
		South Queensland	100
		Winton, Queensland	1
		Northern New South Wales	11
		Perth, Western Australia	?
			} 118

Although the series is small, the proportion of patients with jaundice (13 cases out of 15) is high. As the disease becomes better known in Australia, the proportion of non-icteric cases should rise. In Holland, only 40% of patients develop jaundice, owing to the recognition of mild cases of Weil's disease (Schüffner, 1934).

Canefields Leptospiroses.

Australis A Type Infections.

Of nine cases, some clinical information is available about six. All patients were males. All had headache, muscular pain and prostration. Three patients had albuminuria, three had vomiting, three had eye involvement, two had signs of meningeal involvement, two had pulmonary congestion, one had arthritis and one had jaundice. Fever ranged from five to seventeen days in duration (average 8·2 days), and four patients had a febrile relapse between the sixth and ninth days of illness. One patient died—on the seventeenth day after onset—with bronchopneumonia.

Australis B Type Infections.

Of 50 cases, satisfactory clinical histories are available from 29 patients. All patients except one were males. All had fever, headache, muscular pains, and severe prostration. Fifteen patients were recorded as having gastro-intestinal symptoms such as vomiting and abdominal pain. Eight patients developed jaundice in the first week of illness. Seven patients had conjunctivitis, photophobia or irido-cyclitis, six had cough or congestive signs in the lungs, six had albuminuria, two developed a morbilliform rash at the end of the first week, two had epistaxis, and one patient had transient arthritis. The duration of fever ranged from five to twenty-two days (average 10·9 days), and no fewer than 20 patients had a febrile relapse, usually between the sixth and tenth days after onset. One patient died.

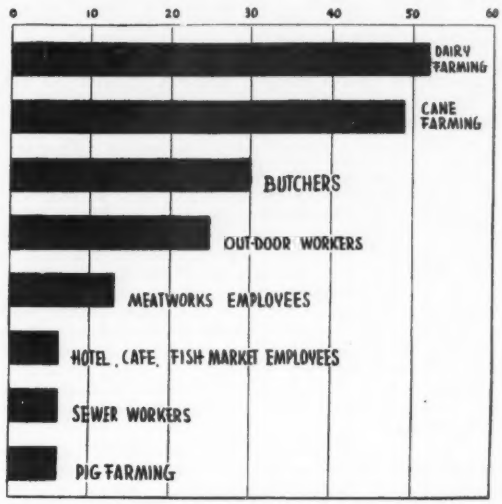

FIGURE III.
Showing occupations of 187 subjects of leptospirosis.

Comment.

Clinically these two types of leptospirosis are similar, and differentiation is possible only by agglutination tests.

Mild Leptospiroses.

Pomona-type Leptospirosis.

The ages of 105 patients varied between nine and sixty-six years. Of 105 patients, only three were females.

In about half the cases the onset of illness was sudden. Usually the first symptoms were headache, malaise and

TABLE III.
Showing Occupations of 187 Patients with Leptospirosis.

Occupation.	Classic Weil's Disease.	Canefields Types.		Mild Types.		Total.
	Leptospira icterohæmorrhagiæ.	*Leptospira australis* B.	*Leptospira australis* A.	*Leptospira pomona.*	*Leptospira mitis.*	
Dairy farmers and employees	0	0	0	47	5	52
Sugar-cane farmers and cutters	3	38	6	0	2	49
Butchers:						
Pig	0	0	0	10	2	
Cattle	0	0	0	7	% 0	30
Calf	0	0	0	5	0	
Retail	0	0	0	6	0	
Miscellaneous outdoor workers (timber-getters, farm labourers, fettlers)	6	9	3	6	1	25
Meatworks employees	0	0	0	10	3	13
Hotel, café, fish market employees	6	0	0	0	0	6
Sewer workers	6	0	0	0	0	6
Pig farmers and employees	0	0	0	6	0	6
Total	21	47	9	97	13	187

chilly sensations, sufficiently intense to make the patient take to bed within a few hours. In a minority of cases, onset was more gradual, and the patients were able to continue at work for a day or two by taking aspirin or "A.P.C." tablets.

Fever was highest in the first day or so after the illness began. In the first week of fever (called the septicæmic stage) leptospiræ may be isolated from the blood-stream by culture or by guinea-pig inoculation. The temperature at this period may reach 40·5° C. (105° F.), especially in children, but the peak is usually somewhat lower.

Temperature charts from 67 patients showed the following features on analysis:

Range of fever	three to thirty-five days
Average	9·75 days
Mode	8·5 days
Duration less than seven days	nine patients
Duration seven to ten days	45 patients
Duration over ten days	13 patients
Febrile relapse	42 patients

It will be seen that the majority of patients had fever lasting between seven and ten days. In two-thirds of the cases, a febrile relapse occurred between the third and eleventh day of illness, but most commonly on the seventh day. Usually there was a return of headache and other symptoms, particularly meningeal, but the average relapse was short-lived and the patient felt well again within forty-eight hours. Van Riel (1946) believes that a relapse occurs in every case of leptospirosis, if the temperature is taken sufficiently often.

The 13 patients whose fever exceeded ten days in duration were above average in age. For instance, five patients whose fever exceeded two weeks were aged thirty-eight, forty, forty-seven, fifty-three and fifty-five years. As with most fevers, young people make a quicker recovery.

Some characteristic temperature charts are seen in Figure IV.

The prominent signs and symptoms of 72 cases of pomona-type leptospirosis are given in Table IV.

In most cases headache was severe and constant, being eased only by morphine. Probably it is caused by leptospiral invasion of the meninges. In some cases it was noticed that headache, although present from the onset, became much more severe on the third or fourth day, and was associated with neck stiffness, drowsiness or irritability. This would mark the development of serous meningitis. In a few cases, headache persisted for a week or so after the temperature had become normal.

Only two patients stated definitely that they had no muscular pain. Pain was usually most severe in the lower limbs and in the back, but no muscle groups were exempt. For instance, several patients had pain in the chest simulating pleurisy. In others, appendicitis or cholecystitis was suspected. The affected muscles were tender on pressure, and muscular power was impaired. Sheldon (1945) has shown that definite pathological changes, rather like Zenker's degeneration, can occur in affected muscles.

Meningeal involvement can be regarded as part of the natural course of leptospirosis, but in many cases it is transient. Prominent signs are severe headache, neck stiffness, drowsiness or irritability. Meningitis, encephalitis and poliomyelitis have all been suspected in this series of cases. Lumbar puncture frequently revealed slight to moderate increase in pressure of the cerebro-spinal fluid, and slight to moderate pleocytosis (usually lymphocytes). Leptospiræ can be isolated from the cerebro-spinal fluid. Lumbar puncture relieves headache, for which patients are generally grateful. Meningeal involvement may occur from the onset of the illness, or it may be noted only during the febrile relapse.

By far the most frequent complaints were of nausea and vomiting, usually from the first day of illness. However, a few patients vomited only during the relapse. Abdominal pain was another common symptom; this is probably due largely to direct involvement of the abdominal muscles, but some may be referred pain due to underlying visceral disturbance, particularly when the pain is epigastric.

Over half the patients complained of severe prostration, saying that they were too weak to move their arms or legs. In most cases prostration developed during the first day of illness. It remained, in many cases, for several weeks after the temperature had fallen. Prostration is probably a manifestation of toxæmia.

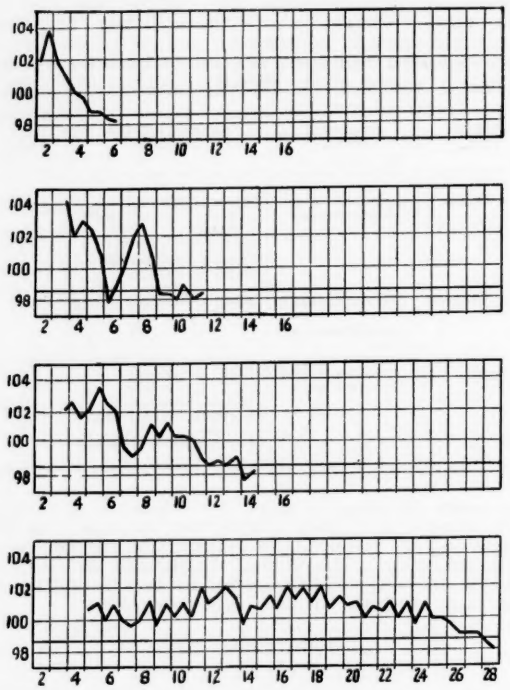

FIGURE IV.

Pomona-type leptospirosis. Temperature charts of four patients, showing variation in duration of fever. Two charts show febrile relapse. Ordinates represent days from onset of symptoms.

Of the 41 patients showing evidence of renal involvement, 24 complained of lumbar pain, 16 had slight albuminuria, 10 complained of frequency of micturition or dysuria, and when the urine of 12 patients was examined microscopically, in 10 samples red blood cells or pus cells were found, and in nine tubular casts were present. More frequent microscopic examination of urine is clearly indicated. In three cases the blood urea level was estimated, but it was not significantly raised. However, in fatal cases of leptospirosis, the blood urea level is usually high (Walch-Sorgdrager, 1939).

Wylie (1946) has shown that in guinea-pigs renal involvement in leptospirosis occurs from the first day of infection. In dogs, infection with *Leptospira canicola* causes chronic nephritis (Stuttgart disease). So far no patients are known to have developed chronic nephritis following pomona-type leptospirosis. This would not be unexpected, as Siguier and Poulet (1947) have reported a case in which the symptoms and signs were predominantly renal.

Leptospiræ invade the collecting and convoluted tubules, producing monocytic infiltration, damage to epithelium and the formation of casts (Sheehan, 1946). Leptospiræ multiply freely in the kidney and are excreted in the urine. The duration of leptospiruria in pomona-type leptospirosis is not known, but I have seen leptospiræ in urine as long as the twenty-seventh day after the onset of the illness. In a case of infection with *Leptospira australis* B, I found leptospiræ in the urine after eleven months, but such cases must be unusual.

Diminished urinary output is frequently noted in leptospirosis. In the case of average severity, this is due partly to fluid loss by sweating, and probably partly to reflex vascular spasm following glomerular damage and causing diversion of blood from the cortex by the circulatory shunt of Trueta. However, in severe cases oliguria or even anuria may occur, and it is likely that death in leptospirosis is most often due to renal failure.

TABLE IV.

Sign or Symptom.	Number of Cases.		
	Present.	Absent.	Unstated.
Headache	71	0	1
Muscular pains	59	2	11
Meningeal involvement	55	1	16
Gastro-intestinal symptoms	53	2	17
Prostration	47	0	25
Renal involvement	41	4	27
Eye involvement	37	7	28
Cough or lung congestion	21	21	30
Rash	15	36	21
Arthritis	12	3	57
Liver involvement	4	1	67

Of 37 patients with eye complications, 32 complained only of conjunctivitis or photophobia. Four patients developed iritis or irido-cyclitis, and one patient, previously reported (Johnson and Brown, 1938), became totally blind for two weeks. All recovered completely.

Irido-cyclitis in pomona-type leptospirosis has been reported also by Gsell, Rechsteiner and Verrey (1946). In the four cases mentioned above, iritis developed between the second and sixth weeks after onset of illness. One patient still complained of blurred vision six months after his illness. Conjunctivitis and photophobia clear up quickly; but as iritis may not develop until several weeks after the onset of illness, discharged patients should be instructed to report any abnormalities of vision.

Cough or signs of lung congestion were noted in 21 patients. One patient had a small hæmoptysis. These observations are not surprising when it is recalled that characteristic post-mortem signs in infected guinea-pigs are ecchymoses and petechial hæmorrhages of the lungs, both in the substance and on the pleural surfaces.

A rash, when present, appeared between the second and seventh days of illness, usually between the fourth and sixth days. Three patients had discrete macules, not unlike a heavy typhoid eruption; but in the other 12 cases the rash was morbilliform—blotchy, macular, and often confluent, particularly in the groins and armpits. It appeared on the body and limbs in all patients and sometimes on the face.

Two patients were isolated as suffering from measles. In several cases the rash was described as being exactly similar to the eruption of scrub typhus.

In the majority of cases the temperature fell as the rash appeared, but usually a febrile relapse occurred within forty-eight hours. The rash lasted about a week, then disappeared gradually without desquamation.

When present, arthritis was usually fleeting and confined to the larger joints. However, two patients had acute polyarthritis involving the joints of the feet and hands, which persisted for about a week after the fever had passed. All recovered completely.

Three patients had tenderness over the region of the liver, one patient had a palpable liver, and one patient was jaundiced.

To my knowledge this is the only patient with pomona-type leptospirosis to develop jaundice. The patient was a Brisbane retail butcher, aged fifty-three years. The fever lasted thirty days, and he developed jaundice about the seventh day. He also had conjunctivitis and iritis.

The presence or absence of jaundice in leptospirosis seems to be determined by two factors—the hepatotropism of the infecting leptospira, and the condition of the liver at the time of the attack. Some leptospiral strains (for example, *Leptospira icterohæmorrhagiæ*) damage the liver more than other strains (for example, *Leptospira pomona*). The patient who was jaundiced had had a previous attack of jaundice following a sore throat. Presumably his liver was not healthy.

Of 105 patients with pomona-type leptospirosis, none died. Thus, this mild leptospirosis has an excellent prognosis, although for an acute infection some patients can be remarkably ill.

Mitis-type Leptospirosis.

Infections with *Leptospirosis mitis* are clinically identical with pomona-type leptospirosis. Of the 13 patients with mitis-type leptospirosis, all were males. Fever ranged from six to twelve days in duration (average 8·8 days). All patients recovered.

Subclinical Leptospirosis.

It is known that workers exposed to *Leptospira icterohæmorrhagiæ*, presumably in minute doses, can develop agglutinins to that organism without becoming ill (Alston and Brown, 1935; Smith and Davidson, 1939). I have collected some evidence which indicates that subclinical infections also occur with *Leptospira pomona*. Serum taken from six employees on the pig-killing floor at the Brisbane Abattoir were tested, and the serum of five contained agglutinins against *Leptospira pomona*, the titre ranging from 1:30 to 1:300. None of these men gave any history of an illness resembling leptospirosis. The serum of the sixth employee contained no anti-pomona agglutinins. He had been working at the Abattoir for a year. Seven months later he developed pomona-type leptospirosis. The other men tested remained well, and were presumably immune.

An attack of leptospirosis appears to confer a solid immunity, as second attacks are rare. It appears likely, too, that subclinical infections may confer substantial immunity. If so, this is important and requires further investigation. It is possible that subclinical infections prevent widespread outbreaks in endemic areas.

Differential Diagnosis.

In North Queensland, scrub typhus is very difficult to exclude, especially if no eschar is present. In scrub typhus, however, the disease usually has a slower onset, and vomiting and meningeal involvement are less common than in leptospirosis.

In southern Queensland, scrub typhus does not occur, but "Q" fever presents equal difficulty. Both diseases occur in people in contact with cattle (such as butchers, meatworks employees and dairy-farm workers) and in men engaged in outdoor work. In "Q" fever the principal symptoms are severe headache, insomnia and fever. There is usually no muscular pain, no arthritis, no rash, no microscopic hæmaturia, no nitrogen retention and no signs of involvement of meninges or eyes.

Other diseases to be excluded are influenza, murine typhus, measles, dengue fever, and perhaps enteric fever. When meningeal symptoms are present, various types of meningitis or encephalitis must be excluded, while hepatitis presents a problem if the patient is jaundiced.

DIAGNOSIS OF LEPTOSPIROSIS.

Clinical Diagnosis.

Leptospirosis will be diagnosed more frequently if the following points concerning occupation and symptomatology are kept in mind. With regard to occupation, patients are likely to have been in contact with rats, pigs, cattle, calves or dogs. With regard to symptomatology, usually the onset is sudden, with headache, muscular pains, fever and severe prostration. Vomiting is extremely common. The occurrence of signs of meningeal involvement in the first week of illness is fairly characteristic. Microscopic hæmaturia is a frequent sign, and may be sought for. Conjunctivitis and photophobia, if present, are helpful signs. Jaundice and purpuric skin hæmorrhages are rare, and are seen only in severe cases of leptospirosis. The febrile relapse is imitated by few other diseases.

Laboratory Diagnosis.

The following laboratory investigations may prove helpful.

1. Leucocyte count. Leucocytosis with relative neutrophilia is the rule in classical Weil's disease, and is usual in the other leptospiroses during the first week. The highest counts are seen in patients with complications such as iritis, jaundice and bronchitis.

2. Erythrocyte count. Mild to moderate anæmia is the rule, though a seriously ill patient may develop severe anæmia. One patient required blood transfusion.

3. Blood urea level. Nitrogen retention is evident in severe cases, and even in mild infections the blood urea level may be raised.

4. Bacteriological tests of the blood. During the first week, when fever is high, leptospiræ can be isolated readily from the blood by culture, if penicillin is not given. Whole blood (0·5 millilitre to 1·5 millilitres—or an equivalent volume of macerated blood clot) is placed in each tube of Schüffner's medium and incubated at 37° or at 30° C. Leptospiræ may be seen by dark-ground illumination as early as the fourth day; but if they are not seen a substantial volume (one millilitre) of the culture is transferred to another tube of Schüffner's medium. This is incubated for two weeks, and examined at least twice a week.

Blood (or blood clot macerated in physiological saline solution) may also be injected intraperitoneally into a guinea-pig, or preferably into two guinea-pigs. Rectal temperatures are taken daily. Infected guinea-pigs develop fever (over 104° F.) between the third and seventh days after inoculation. The febrile guinea-pig is killed, and one millilitre of heart blood is transferred to a tube of Schüffner's medium. Cardinal signs of infection in guinea-pigs are hæmorrhages into the pleural surfaces of the lungs, œdema of the abdominal wall, and a friable pallid liver, often containing small discrete necrotic foci. A small portion of liver, emulsified in physiological saline solution, is examined by dark-ground illumination, when leptospiræ may be seen. Other portions of liver, macerated in water or in physiological saline solution, may be inoculated into other guinea-pigs, a wide-bore needle being used.

5. Agglutination test. This is most reliable after about the tenth day of illness. The technique is simple, but as it is necessary to have available all five Australian serological types of leptospira, the test is more conveniently performed at a central laboratory (such as this department's laboratory or the laboratory at the School of Public Health and Tropical Medicine, Sydney). The test is highly specific, and agglutinins persist in the serum for years after infection. Penicillin therapy appears to delay the appearance of agglutinins and to depress their level in the blood, but not sufficiently to interfere with diagnosis, particularly if two samples of serum, taken at an interval of several days, are available for test.

Treatment.

The most important recent advance in treatment has been the introduction of penicillin. Given early in doses approximating 500,000 units daily, it will often abort the attack, and if given later it does seem to make the symptoms less severe. Over 30 patients mentioned in this paper have received penicillin, and the effect, though not dramatic, has been encouraging. Blood should be taken for culture before treatment is commenced.

More recently it has been suggested that streptomycin and aureomycin are very effective, but I have seen no reference to their use in human patients.

In all cases a high fluid intake is essential, and a chart recording urinary excretion should be kept. The blood urea level should be estimated at least once during the illness. Patients with photophobia should be nursed away from strong light, and the eyes should be frequently examined to detect the onset of iritis. Headache and myalgia may be relieved with codeine compound tablets, but frequently respond only to mixtures containing morphine. Persistent headache and neck stiffness, if severe, are best treated by lumbar puncture.

Usually a patient with leptospirosis causes no anxiety, his illness being mild and his recovery rapid. However, a few patients develop fulminating infections, and during the course of the illness sudden collapse, vomiting of "coffee-grounds" material, anuria and even uræmia may occur. These complications demand energetic treatment. There is some evidence that desoxycorticosterone is useful for collapse. Spinal anæsthesia to the mid-dorsal region may relieve anuria.

Sulphonamide drugs should not be given to patients with leptospirosis, because of the risk of aggravating the renal damage and thereby causing anuria. In nearly every fatal case of leptospirosis in recent years sulphonamide drugs have been given; but, of course, it is impossible to say whether the terminal renal failure was really precipitated by sulphonamides. However, among infected guinea-pigs treated with sulphapyridine in this laboratory there was a higher death rate than among untreated controls.

Prevention.

Because of the sporadic nature of the disease, immunization with leptospiral vaccines is not a practical measure. In general, it may be said that prevention is best achieved by control of carrier animals and by personal hygiene.

Control of Carriers.

In cattle and pigs, very little can be done once the animal is infected. When the carriers are rats, as in cities and canefields, vigorous steps should be taken to diminish the rat population and to prevent access of rats to working places. In cities where Weil's disease is known to occur, rat destruction should be continuous, and relatively simple measures should suffice to keep rats out of fish shops and kitchens in cafes and hotels. Since the first outbreak of leptospirosis in the Queensland canefields, rat destruction there has been active and efficient. Five full-time health inspectors are employed in leptospirosis control in North Queensland. In addition, growers are compelled by law to burn the dry leaves off all standing cane which grows in low-lying areas or which shows evidence of rat damage. Cane burning, which is done just prior to cutting, has been most effective in preventing a repetition of the outbreaks of 1934 and 1935. It drives out the rats, evaporates rat urine and small amounts of water on the ground or in the cane, and removes the dried leaves (or "trash") which cause abrasions on the arms of cane cutters.

Personal Hygiene.

Workers on dairy and pig farms should wear gum-boots or other waterproof footwear when the ground is wet and muddy. Butchers and others handling freshly killed carcasses should cover and treat abrasions and cuts as soon as they occur, and the hands should be washed and dried at the end of each work period. Leptospiræ are quickly killed by antiseptics, even in weak dilution.

Summary.

1. Leptospirosis was first diagnosed in Australia in 1934, and since then 188 cases have been reported. A further 168 cases included in this paper bring the total to 356 cases. All except 15 patients lived in Queensland.

2. The five serological types of leptospira known to cause human leptospirosis in Australia are *Leptospira icterohæmorrhagiæ* (classical Weil's disease), *Leptospira australis* A and *Leptospira australis* B (canefields leptospiroses), and *Leptospira pomona* and *Leptospira mitis* (mild leptospiroses).

3. The chief animal reservoirs of leptospiræ in Australia are dogs and imported rats (Weil's disease), a native rat (canefields leptospiroses), pigs, cattle, calves, and perhaps dogs (mild leptospiroses). Man is infected either by direct handling of infected animals or indirectly by contact with food and water contaminated with infected urine.

4. Areas in which leptospirosis is endemic are the coastal region of North Queensland, devoted largely to the growing of sugar-cane, and an area in south-eastern

Queensland and north-eastern New South Wales, where the principal rural industries are dairying, pig-raising and mixed farming. A further endemic area has been reported from Perth, Western Australia, and it appears likely that the mild leptospiroses will be found to be distributed over a wider area than is known at present.

5. Leptospirosis is to a large extent an occupational disease. People engaged in dairy-farming, pig-farming and sugar-cane farming, butchers and other employees in meat-works, sewer workers, and workers in cafés, hotels and fish markets comprise the great majority of patients.

6. In 15 cases of Weil's disease, fever, malaise, prostration, vomiting, muscle pains and headache were prominent initial symptoms. Thirteen patients had jaundice, and two patients died.

7. Infections caused by *Leptospira australis* A and *Leptospira australis* B are clinically similar. Fever, prostration, vomiting, photophobia and meningeal symptoms were prominent symptoms. Of 35 patients, nine had jaundice. Among 59 patients there were only two fatal infections.

8. Among 118 patients who contracted the mild leptospiroses, only one patient became jaundiced and there were no deaths. Prominent signs and symptoms were fever, muscular pains, prostration, meningeal involvement, renal involvement and eye involvement. Less common were pulmonary congestion, rash and transient arthritis.

9. Subclinical pomona-type infections occur in exposed workers, and by producing immunity may be important in preventing outbreaks in endemic areas.

10. The differential diagnosis and treatment are briefly discussed.

11. Preventive measures depend on the carrier animal. Rat destruction, and the prevention of contamination of food, water and work places by infected urine are important in preventing Weil's disease and the leptospiroses of the canefields. Control of the mild leptospiroses, in which the chief carrier animals are cattle and pigs, is more difficult, and at present the only worthwhile measures appear to be to advise that exposed rural workers wear boots, and that all exposed workers treat and cover promptly any breaks in the skin.

ACKNOWLEDGEMENTS.

I am indebted to the Director-General of Health and Medical Services for permission to publish this report, and to many doctors throughout Australia, but particularly in Queensland, for supplying me with clinical histories. Special acknowledgement is made of the assistance of Mr. H. E. Brown, of this department's laboratory, who for many years has carried out tests for leptospirosis and has cared for the living cultures. Finally, it is appropriate that tribute should be paid to Dr. G. C. Morrissey, of Ingham, and to Dr. T. J. P. Cotter, of Innisfail, for their pioneer efforts in establishing the diagnosis of leptospirosis in Australia during the outbreak of 1934.

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Reviews.

THE PIONEER OF CHEMOTHERAPY.

WE have it on good authority that Miss Martha Marquardt in her book "Paul Ehrlich" has given a true and accurate presentation of the character and personality of this indefatigable, efficient and triumphant worker in the chemical and medical sciences.[1] In a complete and masterly introduction to the book, Sir Henry Dale mentions the anomaly of there being no adequate biography of this pioneer doctor, whose work contributed so positively to the welfare of mankind. It seems that there would be no little difficulty in making such a learned treatise intelligible to the uninitiated, owing to the essentially technical and purely scientific quality of his investigations. To some extent the strictly scientific aspect of Ehrlich's achievements in the laboratory has been already incorporated in a volume which,

[1] "Paul Ehrlich", by Marth Marquardt, with an introduction by Sir Henry Dale, O.M., G.B.E., M.D., F.R.S.; 1949. London: William Heinemann (Medical Books), Limited. 8½" x 5½", pp. 280, with illustrations. Price: 25s.

in 1914, was presented to him by his associates on the occasion of his sixtieth birthday. As Miss Marquardt was closely associated with Ehrlich for many years in the capacity of private secretary, her book should take its place as a valuable supplement to the former publication, as, according to Sir Henry Dale, she has been able "to give more life to the portrait, by showing up some features of kindliness, enthusiasm, remoteness, humour, or petulance, in the man she admired and served with such complete devotion".

The book opens with Ehrlich's childhood at Strehlen in Upper Silesia and his persistent refusal to be educated upon stereotyped lines so that he continued to disappoint his teachers in German composition, but made rapid headway in his own studies of Latin and the mathematics. As a student at the University of Strassburg under Professor Waldeyer, he became deeply interested in the subjects of histology and organic chemistry, and at this early stage of his career began some staining experiments with the aniline dyes. Many years later Professor Michaelis, of Berlin, discovered in the archives of the University of Leipzig the thesis presented by Ehrlich when he graduated in medicine, and he expressed the opinion that it contained original research on the chemical binding of heterogeneous substances to cell protoplasm, and must have been the starting-point for his later discoveries in immunology.

After an unsatisfactory period of clinical work in Berlin, Ehrlich, in 1890, accepted a position under the direction of Robert Koch at his newly founded Institute for Infectious Diseases, where he began to work with Emil von Behring and helped to formulate the fundamental notions of active and passive immunity. Soon after Ehrlich had used his scientific insight to place von Behring's initial discovery of diphtheria antitoxin on a firm basis and had established a rational *modus operandi* for the standardization and administration of the product, an unfortunate misunderstanding brought an abrupt end to their friendly cooperation. Ehrlich continued his incessant research work at Steglitz and later as director of the Institute of Experimental Therapy at Frankfurt-on-Main, where he set out his concepts of the side-chain theory and carried out a long series of experiments leading to the discovery of salvarsan and the newer arsenical compounds.

Miss Marquhardt has succeeded in giving a vivid portrayal of the peculiarities, finer qualities and rare scientific genius of this temperamental little man, although the laboratory atmosphere is too frequently overcharged with his stock phrases and expletives, and with the pungent aroma from Havana cigars.

TROPHIC NERVES.

"TROPHIC NERVES: THEIR ROLE IN PHYSIOLOGY AND PATHOLOGY, WITH ESPECIAL REFERENCE TO THE ÆTIOLOGY OF MALIGNANT, NEUROLOGICAL AND MENTAL DISEASE AND INFLAMMATORY AND ATROPHIC CHANGES", by R. Wyburn-Mason, is a book of 1083 pages, beautifully produced on good paper by Henry Kimpton.[1] It is difficult to find what the author means by "trophic nerves". The semantic problem of definition has not been tackled by him. After reading the book we have the impression that by "trophic nerves" he means the nerves of what is commonly called the autonomic system of nerves. Generally speaking, his thesis is that these nerves by their action liberate acetylcholine and that this affects the trophic conditions of the tissues where the nerves are active.

The organization of the material in the book gives one the impression of a systematic herbarium where Linnæus has been discarded and plants are grouped under "black" and "white". In this book nerves are grouped under "trophic" and "non-trophic". The book follows the pattern of many books on the nervous system. The author starts off with a chapter on the evolution of the vertebrate nervous system, but the relevance of the evolution to the subtitle of the book is not clearly demonstrated. The second chapter on unmyelinated nerve fibres and the autonomic pathways within the nervous system has a number of pages on this subject, but is largely devoted to the general organization of the nervous system. From then on the author deals with every disease to which the body is heir and brings in the cholinergic fibres as having some causative relation to these diseases. In this series of expositions occur all the normal logical fallacies from *non sequitur* to *petitio principii*. The results produced by this interesting performance are too numerous to cite individually, but some gems are as follows:

> The cells of the ganglia are derived from the primitive ectoderm of the embryo, which responds to the "organiser" sterol. The spinal ganglia would, therefore, appear to be one of the sites of action of the sterol bodies of the adrenal cortex and gonads and possibly of vitamin D, though these substances also act on higher trophic centres. The sterol hormones may depress or stimulate activity in these neurones (page 292).

Authority is not stated.

> Flat feet may also develop in adolescence and be found in cases of syringomyelia, tabes and in old age, when obviously due to a trophic disturbance. Their appearance at the time of adolescence must be ascribed to a similar factor (page 488).

The author's summary on page 618 of the function of the parathyreoid gland is too long for quotation, but anybody who is interested in teaching should consult it as an example of what may happen if all rules of evidence and logic are discarded. Another beauty is on page 711:

> It has been alleged that the presence of spider nævi in the skin (de Morgan's spots) point to the existence either of malignant disease or a tendency to it. The significance of these spots has been denied, however. Be that as it may, such telangiectases indicate the presence of local excessive trophic activity in the skin.

In fifty pages at the end of the book the author gives a number of case notes. These are well worth reading. Despite the failings of the book, the author's clinical notes bear the mark of careful observation and they are worth reading because of the interesting association of clinical conditions.

This book contains a lot of information; if the reader is well informed on the subject there is no danger in his considering the generalizations of the book.

[1] "Trophic Nerves: Their Role in Physiology and Pathology, with Especial Reference to the Ætiology of Malignant, Neurological and Mental Disease and Inflammatory and Trophic Changes", by R. Wyburn-Mason, M.A., M.D., B.Ch. (Cambridge), M.R.C.P. (London); 1950. London: Henry Kimpton. 9¼" × 6¼", pp. 1100, with 69 illustrations. Price: 75s.

MATERIA MEDICA, PHARMACOLOGY AND THERAPEUTICS.

THE fifth edition of "Essentials of Materia Medica, Pharmacology and Therapeutics", by R. H. Micks,[1] follows closely on the heels of the last edition of three years ago, a demonstration of the rapid development of new therapeutic agents. In format the new edition is very similar to the preceding ones and once again is much more a small encyclopædia of therapeutic agents than a text-book of pharmacology or *materia medica*. Many new drugs have been included, so that the physician will be able to find sections dealing with the new antibiotics, chloramphenicol and aureomycin. Dimercaprol, cortisone, vitamin B_{12}, trihexyphenidyl, dihydroergotamine and many other new drugs have also been treated in a useful, if somewhat summary, manner, and a description of the properties of some of the new muscular relaxants is now included.

In three pages the author gives a useful account of the antihistamine drugs and with commendable restraint mentions only the more commonly used substances, discussing the group as a whole so that the reader will obtain a useful picture of this class of drugs and can then assess for himself the relative advantages and disadvantages of the many preparations now available. In the discussion on dosage and methods of administration of the antihistamines it is surprising to see no mention of local application in the form of creams which are frequently so useful in urticaria.

The big difficulty which faces the author of a book on pharmacology and therapeutics is to know how much to include and how much to omit. Dr. Micks includes enough information to ensure that the busy physician will be able to turn up almost any drug in use today and obtain a reliable and well-presented account of the status, uses and indications. In the teaching of pharmacology, however, the tendency today is to concentrate on the fundamental mode of action of drugs on the living organism, and it is here that the book is less satisfactory, showing as it does an approach to pharmacology more popular in the period when the book was first written. This, although in no way detracting from the usefulness of this book in the field of therapeutics, is probably an indication that the three subjects of the title are each becoming more specialized and can no longer be regarded as more or less synonymous.

[1] "The Essentials of Materia Medica, Pharmacology and Therapeutics", by R. H. Micks, M.D. (Dublin), F.R.C.P.I.; Fifth Edition; 1950. London: J. and A. Churchill, Limited. 8" × 5½", pp. 448. Price: 21s.

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SOILS AND HEALTH.

MUCH interest has been shown of late years in the effect of the quality of soil on plants and animals, on the nutritive quality of foods and on the health of human beings. A recent issue of *The Journal of the American Medical Association* contains an article on this subject contributed by request by Leonard A. Maynard,[1] Professor of Nutrition and Biochemistry at Cornell University. Maynard points out that many recent articles and books on this subject are popular rather than scientific, and are based on emotion and propaganda rather than on facts. Man's food supply comes, of course, directly or indirectly from the crust of the earth; there must be a close and intricate relationship between the soils of the world and the health of mankind. But Maynard's thesis is that we have as yet very little certain knowledge about this relationship. He advocates, on the one hand, caution in accepting enthusiastic statements based on inadequate data or on speculation, and on the other hand, carefully controlled long-term studies of the essential facts.

In the long run, the total amount of food produced in a given area depends on the fertility of the soil. Many peoples of the world are undernourished because of inadequate food production, or because their natural food resources have been destroyed. E. B. Balfour, in his book "The Living Soil", wrote that: "Society, like a house, does not start at ground level, but begins quite literally beneath the surface of our planet, within the soil itself." It is obvious that there is a general relationship between soils and health. Enthusiasm for this general principle has, however, led to the assumption that there is a more direct relationship between soils and health and that the nutritional quality of the food supply is governed by the fertility level of the soil and can be influenced by various measures which may improve this fertility. The importance of the soil in relation to the mineral requirements of grazing animals has long been recognized. But man is not a grazing animal; his food, especially in industrial areas, comes from far and near, and much of it is altered by manufacturing, preserving and cooking processes. He is therefore unlikely to be affected by mineral deficiencies in the soil unless these are very widespread; and except in the case of iodine, no specific human ill has been traced to a particular soil deficiency. Declining soil fertility has, it is true, been associated with malnutrition, but the relationship between them has been inferred rather than established. Other factors, such as poverty, may be concerned. As far as available evidence goes—and it may, of course, be very incomplete—the nutritive value of animal products does not seem to be influenced significantly by the composition of the soil. Maynard states that in the United States many people in the low income groups live almost entirely on foods of plant origin, so that factors influencing the nutritional value of these foods are of very great importance. This may be true of Australia in the near future, if the prices of meat and eggs continue to rise. Foods of plant origin are influenced more directly than animal foods by the mineral content of the soil in which they are grown; but the health implications of this fact remain uncertain. The vitamin content of foods of plant origin is of special importance in the case of ascorbic acid and carotene; it varies very widely, but it appears to be influenced by climatic and other factors rather than by the fertility of the soil. It is a curious fact that fertilization which increases yield does not necessarily increase nutritional value. In some cases it has been shown that when soil fertility is improved by the addition of nitrogen and other fertilizer factors so that the plants make better growth, the concentration of certain nutrients such as calcium, phosphorus, iron and vitamin C may actually be reduced. It is not growing like a tree, in bulk, that makes the spinach or the cabbage a better food. The prize vegetable marrow may not deserve its blue ribbon, after all.

The problem is bewilderingly complex. It must, however, be solved, and it is of especial importance for Australia, a continent where, over very large areas, the soil is of uniform composition. Any soil deficiencies that exist may affect our whole population. It is certain that they do exist and we have done our best to enhance them by overstocking, and by allowing soil erosion and leaching to proceed unchecked. Scientists in Australia and New Zealand have made substantial contributions to our knowledge of trace-element deficiencies in the soil and of their effect on plant and animal life; but much more work of this kind is required. In his presidential address to the twenty-sixth meeting of the Australian and New Zealand Association for the Advancement of Science, the late Dr. A. E. V. Richardson[1] said that the soil resources of Australia were inadequately known, since for want of trained personnel, soil surveys had been concentrated on the areas of highest productivity. The properties of the soil could, he said, be broadly related to the properties of the rocks from which they were formed and to the rainfall. The heavier the rainfall, the lower were the reserves of plant nutrients in the soil, and the upper layer of soil was the layer from which the rain tended to wash out the more soluble salts (for example, sodium, calcium, magnesium). The iron and clay portions of the upper layers of soil were carried down by the rain and redeposited in the subsoil—in the alluvial horizon. Dr. Richardson said

[1] *The Journal of the American Medical Association*, July 1, 1950, page 807.

[1] *Report of the twenty-sixth meeting of the Australian and New Zealand Association for the Advancement of Science.*

that the two outstanding features of soil distribution in Australia could be stated as follows: "(*a*) The soils of the well-watered high rainfall areas of the coastal regions are mainly heavily leached poor soils of the podsol type, with an accumulation of clay in the subsoil. (*b*) A further feature, and a tragic misfortune, is that Australia's greatest region of soil deposition—the Great Central Basin—is, generally speaking, too arid for agriculture such as is carried out in the great basins of the Mississippi, the Ganges and the Yangtsekiang." Between these two extremes of soils, we have an interesting series of soil groups which Dr. Richardson went on to describe in detail. These more fertile areas are, however, of comparatively limited extent. The question arises whether the qualities of the soil can be related to the physical type which the Australian race is beginning to develop. It seems obvious that we must study the properties of this our piece of earth if we are to foster the good physical qualities of the race and eliminate some of its defects. In Australia the study of soils and health is of paramount importance; it is the base of the pyramid of health. This is surely a problem that should interest the medical profession. The Council on Foods and Nutrition of the American Medical Association has set us a good example in publishing Professor Maynard's authoritative and stimulating review of the subject.

Current Comment.

TERRAMYCIN.

THE latest antibiotic to attain prominence is terramycin. Its discovery was reported early this year, and two preliminary reports on its clinical use have appeared.[1] Terramycin is produced by *Streptomyces rimosus*, a new actinomycete isolated from a soil sample, and is described as a crystalline amphoteric substance which can form either salts with acids (terramycin hydrochloride) or salts with bases (the sodium salt of terramycin). Currently, one microgramme of the amphoteric compound has been defined as containing one microgramme of activity, and the activity of the salts is stated in terms of the equivalent weight of pure terramycin. *In vitro* the antibiotic has a wide activity against many species of bacteria, both Gram-positive and Gram-negative, and also against certain rickettsiæ and viruses. The results of its oral administration to a group of 30 patients with various infections are reported by Ernest Q. King and seven others. The infections included pneumococcal pneumonia, urinary tract infections due to *Escherichia coli* and *Aerobacter aerogenes*, whooping-cough, bacteriæmia due to *Salmonella choleræ-suis* var. Kunzendorf, pneumonitis and lung abscess with mixed bacterial infections. The usual dosage schedules were as follows: for patients aged fourteen years and older with urinary tract infections, 750 milligrammes every six hours; for patients of the same age group with urinary tract infections, 500 milligrammes every six hours; for children aged nine years and younger, 500 milligrammes every four hours. Assayable amounts of terramycin were found in the blood and urine within one hour and for five hours after the administration of 750 milligrammes of the drug by mouth. The results obtained were in general encouraging, particularly with the urinary tract infections, and support the claims of terramycin to a place among the useful antibiotic drugs. The incidence of side reactions was low, most being mild and subsiding with treatment; the experience in this series indicates that occasionally severe gastro-intestinal distress, including diarrhœa, may necessitate withdrawal of the drug. The effects of terramycin in the treatment of venereal disease, as recorded by F. D. Hendricks and seven others, appear to be satisfactory. In this series 81 patients were treated, 73 with gonorrhœa, six with syphilis and two with *granuloma inguinale*. Of the patients with gonorrhœa, 15 were given two doses orally, each of one gramme, with an interval of six hours, and all were cured; 10 were given two doses orally of 0·5 gramme, with the same interval, and eight were cured; smaller dosages were less effective. Doses of 60 milligrammes per kilogram of body weight per day, continued for twelve days, produced prompt healing in the two cases of *granuloma inguinale*. A similar dosage, continued for eight days, caused rapid disappearance of organisms from lesions of patients with primary and secondary syphilis; the results of serological tests one month later were negative in the three patients investigated, but further observation is, of course, necessary. Side effects were observed in only six cases, the most severe being diarrhœa and vomiting in one case. These are all preliminary reports and further results will be awaited with interest. However, terramycin appears to compare favourably with the established antibiotics.

[1] *The Journal of the American Medical Association*, May 6, 1950.

CARDIO-VASCULAR AND RENAL ACCOMPANIMENTS OF LONG-STANDING DIABETES.

THE growing interest in the cardiac, vascular and renal accompaniments of diabetes of long standing is an indication of the great improvements which have taken place in the treatment of the disease. Clinicians now aim at removing not only the acute hazards of the disease, but also those more stealthy dangers which may rob the diabetic of his comfort of living and his length of days. The importance and the extent of these threats are worth investigation, even if this can only be made by long-term study. Johan Mårtensson has interested himself in the prognosis of diabetes, and has recently published a study of 221 patients who survived at least fifteen years.[1] In a previous communication he described the clinical histories of this group, including the causes of death, and now deals with the incidence and nature of the complications of the vascular type. Of these hypertension is one of the most significant, and has one advantage, that of easy recognition. In this series it was present in 57% of the whole, in 48% of the men and 65% of the women; this preponderance in the female may be otherwise expressed, that 43% of the hypertensives were men and 57% women. The whole group of patients was composed equally of men and women. This preponderance has been noted by others, and may partly be explained by the higher percentage of women in the higher age groups. It may be noted also that 18 of the hypertensive patients showed signs of this condition before the age of fifty years, and included among these were several who also had severe renal disease. Arteriosclerosis, apart from hypertension, is, of course, a well-known accompaniment of diabetes: the author remarks that, while it seems reasonable to assume that the metabolic disturbances which occur in diabetes are similar to those biochemical changes that dispose to arteriosclerosis, we cannot as yet establish any sure relationship between any single element of diabetic pathology and the vascular disease. Many writers have drawn attention to the early onset of arteriosclerosis, even as early as the second decade of life. Mårtensson points out that attempts to make a clinical estimate of the extent of sclerotic vascular changes are frequently over-optimistic when compared with control by autopsy. Clinical symptoms such as those due to impaired circulation are the usual basis for such estimations, for radiological evidence is apt to be misleading by its dependence on calcification, a sign which does not run parallel with arterial insuf-

[1] *Acta medica Scandinavica*, Volume CXXXVIII, fasc. II, 1950.

ficiency. Arteriosclerosis of the coronary vessels is the most important type, since it affects so adversely the diabetic's chance of long survival. In the days when the treatment of syphilis was neither so thorough nor so well organized as it is now, confusion was not unknown between specific and non-specific endarteritis, and a pathologist of that era once pithily remarked that, now that the distinction was quite clear among morbid anatomists diabetes as a cause of arteriosclerosis had come into its own. Comparison of diabetic and non-diabetic series has shown that coronary sclerosis is decidedly commoner among diabetics than non-diabetics. Mårtensson found that 43% of the whole of his series had coronary sclerosis, but that it was present only in the older patients, usually only those over sixty years of age. No marked sex preponderance was observed. Other writers have found that coronary sclerosis appeared earlier and more quickly in men than in women, but this author's figures are rather small to be compared with others. The diagnosis was checked by electrocardiographic and radiographic methods, and where opportunity offered, by autopsy. Evidence of arterial occlusive disease was present in 42 cases, 19% of the whole. There is, of course, difficulty in establishing a diagnosis here also, since ulceration and gangrene, though of diagnostic value, depend upon other factors to some extent, such as the rate of development of the changes.

Renal disease in diabetics has aroused interest lately, and has been observed in young patients as well as in old. Though it is usually attributed to the arterial changes, it is not certain whether there may be contributory metabolic factors, too, such as a hypothetical effect of biochemical alterations in the blood and other body fluids. Joslin has found that chronic glomerulonephritis is the most common variety of diabetic renal disease. Mårtensson remarks that chronic pyelonephritis is surely more common than is usually thought, but he agrees that there is probably one common cause or group of causes concerned. Of 211 patients examined for nephropathic changes, 71, or 34%, were found to present evidence of renal disease. A more serious aspect of these figures appears when it is realized that half the patients in the age group under thirty years had renal disease, even though it was usually mild. It would appear, too, from the author's results that the findings of others are supported, that renal disease in diabetes depends rather upon the duration of the diabetes than upon the duration of life. Post-mortem studies showed that sclerotic changes were most frequent: the picture was that of an intercapillary glomerulosclerosis. Urea clearance tests carried out on a number of patients in the series did not give any results of striking clinical value. This study serves to confirm interest in diabetes considered from the long-term viewpoint. It would be interesting to see the results of the investigation of a large series of patients carried out with the aim of assessing the relationship of these chronic complications with complete or incomplete biochemical control of the disease.

THE PATHOLOGY OF DISSEMINATED SCLEROSIS.

FROM time to time disseminated sclerosis attracts attention as one of the mysteries of neurology. Relatively common in some countries, particularly in Europe, it has been the subject of many studies, and interest in it has been revived by reason of recent work on other demyelinating diseases of the nervous system. Fortunately it is not common in Australia, and in this country an affection such as retrobulbar neuritis, accounted as being frequently due to disseminated sclerosis in Europe, is regarded as much more likely to be caused by other agencies. In the last generation one dramatic scene in the history of this crippling disease was the discovery of the alleged infective agent, the so-called *Spherula insularis*, but hopes were shattered when it was shown that the work was not soundly based. Failure to establish an infective cause does not remove this as a possibility. I. Huszák and J. Szák in articles on the pathology of disseminated sclerosis point out that the demyelinization which is the destructive process characteristic of the disease might conceivably be caused by distant invasion by microorganisms, with a remote effect on the nervous system.[1] However, they state that the most favoured hypotheses today are those which invoke the vascular system and those which incriminate metabolic deficiencies. Theories of deficiency are supported by the disease of lambs known as "sway-back", which is caused by a deficiency of copper in the food of the ewes, and can be treated successfully by spraying the fodder. It is difficult on such an hypothesis to explain the striking and well-known feature of remissions in disseminated sclerosis, but it must be admitted that this is difficult to explain in terms of any ætiological assumption. The vascular theories are at present attracting considerable attention. Demyelinization as a pathological process has been carefully reviewed by a number of workers, who, as Huszák and Szák remark, are divided into two camps: those who advocate an allergic reaction in the nervous system such as appears to take place after vaccination, and those who hold that the basic lesion is thrombosis of small veins leading to occlusion. Putnam, the chief exponent of the latter school, believes that the white matter is more susceptible to thrombosis than the grey matter, and cites the thrombotic changes which are associated with various forms of toxic change due to illness or poisoning. Huszák and Szák, finding that no experimental evidence existed as to why the white matter was so curiously prone to thrombotic change, by comparison with the grey matter, have produced some experimental work which fills this gap. They investigated the thromboplastic substances of both the white and the grey matter of human and horse brain, and after making extracts after the methods of Quick, examined the effect of these by prothrombin tests. The extracts of white matter coagulated fibrinogen far more quickly than those of the grey matter. It is not necessary here to pursue further details of this work; the conclusion reached was that the white matter was far more active in thromboplastic effect, and this was due to the difference in the heparin content. Huszák and Szák followed up this observation by investigating the coagulant power of the blood of patients suffering from the active and remittent stages of disseminated sclerosis. They found that the blood coagulated more readily than in normal persons when the disease was active, but during remissions no variation from the normal could be detected. This difference they attribute to a decrease in the thrombin-inactivating power of the blood during the stage of activity, when demyelinization is going on. They emphasize that too much significance must not be laid on the enhancement of the susceptibility of the blood to clotting as a cause of venous thrombosis in the venules of the white matter, for if this were so thromboses would be produced every time this change occurred in the blood; this we know is not the case. Therefore there must be a local factor which contributes to thrombus formation. The authors regard thrombosis as a secondary phenomenon, whose occurrence accounts for the sudden appearance of new symptoms.

The possibility that anticoagulant treatment may be of value is interesting. Huszák and Szák think that it may be justifiable in disseminated sclerosis, but only when there is a considerable decrease in the thrombin inactivation power of the blood. They reinforce the usual and important advice concerning the caution necessary in the use of dicoumarin. The irregular action of this substance is well known, and its use needs careful control; heparin would be preferable, but has the drawbacks of limited supply and expense. It is evident that clinical applications of this work must be made with care and reservation, for, even if we have some knowledge of alterations in blood state which may predispose to the local lesions, we still know little of how or why these occur, why they should be so curiously disposed in certain clinical patterns, or why the course of the disease should fluctuate in its familiar manner, which makes diagnosis difficult and prognosis uncertain.

[1] *Acta medica Scandinavica*, Volume CXXXVIII, 1950.

Abstracts from Medical Literature.

MEDICINE.

The Status of Ulcer Therapy.

S. P. BRALOW, H. KROLL, M. SPELLBERG AND H. NECHELES (*The American Journal of Digestive Diseases*, March, 1950) review the present antacid therapy for peptic ulcer, and state that there is no management that fulfils completely the theoretical ideal. An ideal antacid should combine low cost, tastelessness, non-astringency in relation to the oral mucosa, capacity of a small amount to neutralize a large amount of acid, adsorption of pepsin, non-constipating and non-laxative properties, failure to leave the stomach too quickly and a prolonged action; a secondary acid rise should not occur, the preparation should be non-absorbable so that alkalosis cannot arise, and no distressing gases should evolve, such as carbon dioxide. The authors examine and reject (or defer for further investigation) in turn absorbable alkalis, such as Sippy's powders; milk protein, cream and alkali; "non-systemic" alkalis (those absorbed little or not at all), such as calcium and magnesium preparations including carbonates; colloidal aluminium preparations; protein hydrolysate; the detergent sodium lauryl sulphate; enterogastrone; and hog's mucin. The authors, after investigation, have concluded that requirements are best met by sodium carboxymethyl cellulose, a synthetic gastric mucin related to the polyglucuronic acid of normal mucin; they state that it is bland, adheres to the gastro-duodenal mucosa, is non-absorbable and non-constipating, and has a sufficient neutralizing ability

Intravenous Administration of Tetracaine ("Pontocaine") Hydrochloride.

J. S. HORAN (*Archives of Internal Medicine*, June, 1950) discusses the efficacy of a slow intravenous drip administration of procaine ("Novocain") in 0·1% and 0·2% solutions for the treatment of many traumatic and pain syndromes, and describes a search for a more potent solution which could be given quickly and in small doses, suitable for use in a physician's office. He selected tetracaine ("Pontocaine") hydrochloride, which is about ten times as potent and ten times as toxic as procaine on the basis of animal experiments. In the preliminary work reported, a series of 104 patients received a total of 204 intravenous infusions of tetracaine for pain, itching, asthma and miscellaneous conditions. One patient fainted and one patient had slight nausea and vomiting. Some complained of transient dizziness. No other reactions were noted. Administration of oxygen, barbiturates or stimulants was not required. The optimal dose has been found to be 10 millilitres of 0·25% tetracaine solution, given intravenously. The solution is administered slowly, over three to five minutes. The patient is kept supine during the infusion and for about five minutes afterwards. The 0·25% solution is prepared by adding the contents of a 250 milligramme ampoule of tetracaine crystals to 100 millilitres of isotonic sodium chloride solution. This solution can be kept in a rubber-stoppered bottle from which small amounts can be drawn as needed. The crystals should be dissolved in an isotonic solution rather than in distilled water. The injection can be conveniently made with a 25 gauge needle, which causes only slight venous trauma and facilitates slow administration, although any needle suitable for intravenous use can be employed. Tetracaine has been administered intravenously in the present study in the treatment of arthritis, leprosy, muscle strain, lower back pain, asthma and miscellaneous conditions, such as hyperactive carotid sinus syndrome, pain in the chest and neuritis. Of 104 patients treated, 98 or 94% experienced improvement. Ages ranged from fifteen to eighty years.

Sudden Death.

D. LEYS (*Edinburgh Medical Journal*, January, 1950) describes a series of cases under the title of inheritance of a factor causing sudden death in childhood and early adult life. The patients were relatives or descendants of a Scottish farmer who died at the age of sixty-six years, diabetic, hypertensive, hemiplegic, with gangrene of a foot and uræmia. Xanthomatous patches were present on the trunk and limbs; the blood cholesterol content was 212 milligrammes *per centum*. A brother, aged twenty-one years, had died suddenly. Three of the patient's children, aged eleven, thirteen and sixteen years, had died suddenly; five living children were examined, and three were found to have conduction defects in the cardiogram, two of whom died suddenly at the ages of sixteen and twenty-three years. The third had syncopal attacks. Several other relatives died suddenly or had bundle branch or auriculo-ventricular block. Hypercholesteræmia was noted in the wife of the farmer and in several of the children. Coronary disease was rare in this group. The conduction defects with a *P-R* interval up to 0·24 second may have been significant. Xanthoma of the skin and increased cholesterol content in the blood occurred in several of the patients, and appeared to be inherited congenital defects.

Thyreoid Disease and Radioactive Iodine.

E. E. POCHIN (*The Lancet*, July 8 and 15, 1950) states that the circulation of iodine through the body may be examined quantitatively with radioactive iodine, and the duration of various stages of the iodine cycle compared in Graves's disease and in health. Normally iodide injected intravenously is distributed within two hours through 40% of the body weight, whence it is removed by thyreoid or kidneys after a mean time of six to eight hours. It then remains for many weeks in the thyreoid and for a few days as circulating thyroxine before reentering the cycle or being excreted by the kidney. In Graves's disease the mean stay as iodide is one to two hours; that in the thyreoid averages five days and may be less than one day; two days are spent in circulation as thyroxine. Most of the iodine liberated from the tissues probably reenters this cycle. The thyreoid's avidity for iodide may be measured by the rate at which it clears plasma of radio-iodide. In Graves's disease this thyreoid clearance rate is usually raised from a normal average of 25 millilitres per minute to over 100 millilitres per minute. Iodine is at first found to be concentrated in the thyreoid, in the bladder and kidneys, and in gastric and salivary secretions. In thyreotoxic patients, after a few days some localization may occur in the liver area, presumably from thyroxine concentration. The distribution of radio-iodine may indicate whether a thyreoid carcinoma itself concentrates iodine or replaces iodine-concentrating thyreoid tissue. The author discusses the treatment of iodine-concentrating carcinoma with radio-iodine.

Lung Carcinoma in Iceland.

NIELS DUNGAL (*The Lancet*, August 12, 1950) states that lung cancer is a rare disease in Iceland, being ninth in frequency among carcinomata of various organs, according to an analysis of necropsy findings. The increased frequency of lung carcinoma in all civilized countries is thought to be connected with the increase in the consumption of cigarettes that has taken place, particularly in Great Britain and the United States of America, in this century. In Iceland cigarette smoking, though practised since the beginning of the century, has increased at a much slower rate than in other countries, and the annual consumption did not reach one pound per head until 1945; in Great Britain and Finland it passed that amount before 1920. The author states that if it takes twenty to twenty-five years to develop cancer from smoking cigarettes, these differences in consumption will explain why lung cancer is rare in Iceland. In the last few years the annual consumption of cigarettes in Iceland has reached 1·5 pounds per head, and if the above assumption is correct a considerable rise in the incidence of lung carcinoma may be expected in 1960-1965.

Polyarteritis Nodosa.

M. H. ROSE, D. LITTMANN AND J. HOUGHTON (*Annals of Internal Medicine*, June, 1950) review some of the reports on *polyarteritis nodosa* and discuss the pathology and clinical manifestations associated with it. The case histories of six patients are presented, together with the autopsy findings in the five who died. The authors observe that it may be stated that *polyarteritis nodosa* is a serious, almost uniformly fatal disease of obscure ætiology, which appears to be increasing in frequency. As the result of recent and current investigation, it seems probable that it is somehow associated with hypersensitivity and related to other diseases of unknown ætiology, including rheumatic fever, rheumatoid arthritis, nephritis, bronchial asthma and possibly hypertension. Because of its widespread vascular distribution, numerous organs may be affected, with resultant multiple and bizarre symptomatology. However, involvement of the gastro-intestinal and genito-urinary systems occurs in practically every instance. Accordingly, complaints related to these systems, if accompanied by chronic fever and leucocytosis, should suggest the possibility of *polyarteritis nodosa*. The proved presence of peptic ulcer, however, should not signal the end of a search, since it may be merely one

finding of a widespread disease. In a similar manner, rheumatic manifestations may coexist with those of *polyarteritis nodosa*. Skin findings are common, but these are varied, and except when nodules are present are of little aid in arriving at the correct diagnosis. The so-called classical picture including bronchial asthma and eosinophilia is, in the authors' experience, uncommon.

Treatment of Barbiturate Poisoning.

ERIC NILSSON AND BENDT EYRICH (*Acta medica Scandinavica*, May 5, 1950) discuss the treatment of barbiturate poisoning. The clinical notes of five patients suffering from this condition are presented. It is recommended that gastric lavage should not be undertaken, because of the risk of aspiration of the stomach contents into the lungs of the reflexless patient. The most important measure is to establish a free airway by means of nasal intubation, followed by the administration of oxygen. The authors also use bronchial suction and change the position of the patient with slappings of the chest wall. Two to three litres of fluid are given daily, and blood transfusion is advised when considered necessary. So-called central analeptics are dispensed with, and it is recommended that they should be avoided in the treatment of patients for serious barbiturate poisoning.

Right and Left Sided Anginal Pain.

R. WYBURN-MASON (*American Heart Journal*, March, 1950) presents embryological, phylogenetic and clinical evidence to show that the right side of the mediastinum, the chambers of the right side of the heart and the sino-atrial node are right-sided structures and that disease affecting them may cause right-sided reference of anginal pain. The left side of the mediastinum, the chambers of the left side of the heart, the pulmonary veins, the interatrial septum and the atrioventricular node are left-sided structures, disease of which may cause left-sided pain.

Influenzal Meningitis.

M. E. DRAKE *et alii* (*The Journal of the American Medical Association*, February 18, 1950) discuss aureomycin in the treatment of influenzal meningitis. They state that aureomycin hydrochloride, a yellow powder derived from *Streptomyces aureofaciens*, is well tolerated when given orally and intravenously. Toxic effects in man—nausea, vomiting and diarrhœa—are rare. Blood levels, urinary excretion and cerebrospinal fluid concentrations are all reached rapidly. Three patients with influenzal meningitis were treated with aureomycin. The average total dose was 10·3 grammes over a period of thirteen days. The patients' ages were between six months and three and a half years. Seven patients were treated in all. Aureomycin was used both intravenously and orally. The patients had obvious signs of meningitis; the spinal fluid was cloudy and contained 1000 to 15,000 leucocytes and 4·0 to 30·0 milligrammes of sugar per 100 millilitres. Gram-negative bacilli were seen in all direct smears, and cultures on Fildes agar gave uniformly positive results for *Hæmophilus influenzæ*, type B, in twelve hours. An oral dosage of 250 milligrammes of aureomycin every four hours was the standard, but was often exceeded; intravenously 50 to 100 milligrammes were given every six hours at times. All patients recovered without neurological abnormality, except one patient, in whom hydrocephalus seemed to be developing.

Mumps Orchitis and Testicular Atrophy.

CHARLES WERNER (*Annals of Internal Medicine*, June, 1950) questioned and medically examined 2000 apparently healthy male subjects ranging in age from fourteen to forty-three years, to ascertain the incidence of orchitis occurring as a complication of mumps (epidemic parotitis). He states that 54% gave a history of having had mumps infection. Of these, 80% had had the infection before the fifteenth year. The commonest age of onset was ten years. In 5% of all cases of mumps and in 19% of cases of mumps with onset after the thirteenth year there was a history of orchitis as a complication of the disease. This was right-sided in 35% of cases, left-sided in 31% and bilateral in 33%. Testicular atrophy developed subsequently in 36% of all cases of mumps orchitis. This constituted 1·7% of all cases of mumps in the series and 6·8% of cases which occurred after the thirteenth year. Of a total of 58 cases of testicular atrophy following mumps orchitis, the atrophy was right-sided in 50%, left-sided in 39·7% and bilateral in 10·3%. Of the 44 cases of testicular atrophy from various causes found in this study, mumps orchitis was the causative factor in 43%. A subsequent paper will present further discussion of mumps orchitis.

The Ocular Manifestations of Riboflavin Deficiency.

JOHN J. STERN (*American Journal of Ophthalmology*, July, 1950) discusses the corneal vascularization that appears in riboflavin deficiency. He considers that much confusion in diagnosing riboflavin deficiency from ocular signs is due to incorrect diagnosis of vascularization of the cornea, and states that hyperæmia of the limbic plexus, circumcorneal injection and engorgement of the limbus have been erroneously regarded as early signs of ariboflavinosis. For practical purposes it must be insisted that new vessels must appear in the cornea before one can speak of corneal vascularity. Circumcorneal injection, although it may represent the initial stage of corneal vascularization, is in itself non-specific. Corneal vascularization of riboflavin deficiency always occurs in the entire circumference of the cornea and is nearly always bilateral. However, trauma or disease may produce vascularization in one eye when the degree of riboflavin deficiency is insufficient to produce signs in the other eye. The vascularization is to be differentiated from that which occurs in *keratitis rosacea*, phlyctenular keratitis and trachoma. In respect to phlyctenular keratitis the vascularization is similar to that seen in ariboflavinosis and responds to riboflavin. The author maintains that phlyctenular keratitis is really a riboflavin deficiency conditioned by an allergic reaction. The author concludes that riboflavin deficiency always causes corneal vascularity, if it lasts long enough to produce a low enough riboflavin concentration in the tissues, and the vascularization may be precipitated by chemical or mechanical trauma to the cornea in the presence of a subliminal riboflavin deficiency.

Thiocyanate in Hypertension.

E. J. FISCHMANN AND A. FISCHMAN (*American Heart Journal*, April, 1950) found that in over two-thirds of a series of 50 patients with essential hypertension the administration of thiocyanate was accompanied by a fall in diastolic and systolic blood pressure of 10% to 25% and by remission of symptoms; but in only one-third of the series was there a comparable rise in blood pressure after withdrawal of the drug. In a further one-fifth a rise of less than 10% occurred. The authors consider the most probable explanation to be that the fall in blood pressure was not due to the drug in a number of the patients treated. In a control series of patients not treated with thiocyanate a spontaneous fall of blood pressure of comparable degree occurred in one-third: this was ascribed to rest and to the patients' becoming accustomed to having their blood pressure measured. The reversal of electrocardiographic abnormalities, known to occur in hypertensive patients after sympathectomy, was not observed after the administration of thiocyanate.

Aureomycin in the Treatment of Poliomyelitis.

E. APPELBAUM AND R. SAIGH (*The Journal of the American Medical Association*, June 10, 1950) report the results of treating with aureomycin 38 patients with non-paralytic poliomyelitis during the early phase of the disease; 66 patients did not receive the drug and served as controls. The aureomycin-treated patients and the controls were admitted to hospital during the same period and were similar in all essential respects. The clinical results were about the same in the treated and the control patients. The development of paralysis in two of the treated patients, but in none of the controls, was regarded as fortuitous. In this study the use of aureomycin early in the disease did not appear to affect favourably the clinical course of poliomyelitis. The use of aureomycin in a group of 20 paralytic patients not included in this study failed to produce any striking change in the clinical picture.

Veratrum Viride.

W. S. COE *et alii* (*The Journal of the American Medical Association*, May 6, 1950) record the results of treatment of hypertension with *veratrum viride*. Twenty-five patients were treated with powdered *veratrum viride* ("Vertavis"), 10 Craw units night and morning in tablet form. Placebo tablets were given to other patients. The authors state that there was no significant lowering of blood pressure in the patients treated. Toxic symptoms appeared in 64%, especially nausea and vomiting. Symptomatic relief was obtained in 60% of patients receiving placebos as well as those taking *veratrum viride*. The drug is not recommended for use in hypertension in the present state of knowledge.

British Medical Association News.

SCIENTIFIC.

A MEETING of the New South Wales Branch of the British Medical Association was held on June 22, 1950, at the Royal North Shore Hospital of Sydney, Crow's Nest, New South Wales. The meeting took the form of a number of clinical demonstrations by members of the honorary medical and surgical staff of the hospital. Parts of this report appeared in the issues of October 21 and November 4, 1950.

Right Calculous Pyonephrosis.

DR. COLIN EDWARDS presented a single woman, aged fifty-nine years, who had been admitted to hospital on May 4, 1950, with a history of pain in the right side of the abdomen for five weeks, the occurrence of hæmaturia once three months previously, and frequency and scalding of micturition for six years. The pain in the right side was present as a dull ache all the time, with attacks of sharp pain lasting up to one week. A right retrograde pyelogram revealed the presence of a large branching stone, and probably of a small one also in the right upper calyx. There was no evidence of hydronephrosis. Right nephrectomy was performed, and a calculus was found in the upper calyx as well as a renal abscess. Convalescence was uneventful, with complete recovery. Microscopic examination of a section of the kidney revealed that in the area chosen suppuration in the pelvis had destroyed the epithelial lining, so that it had become virtually an abscess cavity lined by granulation tissue which was based directly on the kidney substance. Further out towards the cortex the typical changes of pyelonephritis could be seen.

Renal Infarct.

Dr. Edwards's next patient, a married woman, aged forty-seven years, had been admitted to hospital on April 28, 1950. She said that after her menstrual period in January she had noticed hæmaturia which lasted for one week. She had no other symptoms. Her blood pressure was 150 millimetres of mercury, systolic, and 110 millimetres, diastolic; her cardio-vascular system and chest were normal on clinical examination. Her liver was palpable one finger's breadth below the costal margin. Her kidneys were neither palpable nor tender. X-ray examination of the chest revealed no abnormality. An excretion pyelogram revealed the presence of a filling defect in the right renal pelvis. The blood urea content was 30 milligrammes *per centum*. The urine contained 60 to 80 pus cells per high-power field, but no organisms were grown on culture. Right nephrectomy was carried out on May 2, 1950, and was followed by an uneventful convalescence and complete recovery. Pathological examination revealed the presence of a renal infarct.

Renal Hypoplasia, Hydronephrosis and Calculus.

Dr. Edwards's last patient was a man, aged eighty-four years, who had been admitted to hospital on April 10, 1950, with a history of attacks of pain in the left side of the abdomen lasting up to six hours at the rate of two to three per month since 1947. The patient said that he had passed pus in his urine for years. His blood pressure was 160 millimetres of mercury, systolic, and 80 millimetres, diastolic. His cardio-vascular system and chest appeared to be normal. No tenderness or palpable mass was found in his abdomen. X-ray examination of his abdomen revealed an opaque area in the region of the left kidney, and an excretion pyelogram revealed the presence of a left renal calculus with poor function of the left kidney. Left nephrectomy was carried out, and a small atrophic kidney was removed with a calculus in the pelvis. Convalescence was relatively uneventful. The pathologist reported that the calculus consisted of calcium oxalate and calcium phosphate. Microscopic examination of the kidney revealed a considerable degree of atrophy. The glomeruli were fibrosed and the tubules had mostly disappeared. The remaining tubules were dilated and the lumen was filled with "colloid" material. The pelvis contained evidence of chronic inflammation and thickened stratified, but not keratinized, epithelium.

Pyogenic Infective Sacro-Iliac Disease Complicating Pregnancy.

DR. A. A. MOON and DR. A. R. HAMILTON showed a married woman, aged twenty-five years, who had been admitted to hospital on December 23, 1949, being then about four and a half months pregnant. She had been well until about five weeks previously, when she complained of left sciatic pain. She was admitted to another hospital with a provisional diagnosis of rheumatic fever, but was discharged after one week and told to walk about. The pain in the left hip had continued, and she had developed gross œdema of both feet and legs. For one week before her admission to the Royal North Shore Hospital she had been unable to walk about. X-ray examination revealed appearances suggestive of osteomyelitis of the left sacro-iliac joint. A blood count revealed a hæmoglobin value of 56% and a leucocyte count of 12,850 per cubic millimetre. A transfusion of one litre of blood was given. The œdema disappeared after four days. The result of a Mantoux test was negative. She was examined by the honorary orthopædic surgeon, who diagnosed chronic infective arthritis of the left sacro-iliac joint. On January 9, 1950, a pelvic sling was applied, with extension. She continued to improve symptomatically and became completely free of pain by February 17. X-ray examination then revealed absorption, with some sublimation of the left sacro-iliac joint. After that occasional attacks of hip pain occurred. On March 15 a tender, fluctuant swelling appeared over the left sacro-iliac joint. It was aspirated, and hæmolytic *Staphylococcus aureus* in pure culture was grown from the pus. Large doses of penicillin were injected into the abscess, and 500,000 units of penicillin were administered every eight hours. At that stage the pelvic sling was removed from the patient, who was then thirty-four weeks pregnant. The organism showed resistance to all antibiotics including "Chloromycetin" and aureomycin. The results of a Mantoux test, guinea-pig inoculation and attempted culture of the tubercle bacillus were all negative. The abscess was aspirated at intervals of five days three times. All leg traction was removed. On April 12 a lower segment Cæsarean section was carried out with myomectomy. The abscess was aspirated twice during the healing of the section wound, and on April 19 was incised and drained. By May 4 the discharge had ceased and the patient had no further pain. X-ray examination one month later revealed improvement, with considerable deposition of calcium. The lesion appeared to be settling down satisfactorily. The patient was discharged from hospital with the instruction to wear corsets.

Probable Tuberculosis of the Sacro-Iliac Joint Complicating Pregnancy.

The second patient shown by Dr. Moon and Dr. Hamilton was a married women who had become pregnant in May, 1949, and shortly afterwards had developed pain in the back. During the latter months of pregnancy the pain had become true sciatic pain necessitating admission to hospital. It was relieved by rest and extension. The patient was discharged from hospital and confined in a private hospital. Two weeks later, on February 4, 1950, the patient was readmitted to the Royal North Shore Hospital of Sydney with pain over the left sacro-iliac joint and sciatica. X-ray examination revealed some absorption of the left sacro-iliac joint. The result of a Mantoux test was positive. The condition was considered to be chronic infective arthritis, probably tuberculous. The patient was put onto a Robert Jones abduction frame with extension traction of the lower limbs, and the traction was continued with symptomatic improvement. The latest X-ray films had shown improvement.

Cretinism.

DR. CLAIR ISBISTER and DR. PAULINE WEBB showed a baby suffering from cretinism. The mother, who had had one previous pregnancy, was Rh-negative. She had gained more weight during the early part of her pregnancy than the ante-natal clinic approved, and had been given a diet of reduced carbohydrate content in the early months. She developed œdema during the last month of pregnancy without hypertension, and was given a salt-free diet. Her total increase in weight during pregnancy was two stone three pounds. There was nothing else of note about the mother's health except a hæmoglobin value of 90%. On October 27, 1949, a female infant weighing 10 pounds 15 ounces was delivered normally. The mother had a severe post-partum hæmorrhage after delivery and required blood transfusion. During the neonatal period the baby had a hæmatemesis and also required transfusion. At the time of discharge from hospital the baby was being fully breast fed, but was one pound under birth weight. Otherwise she was well. On January 9, 1950, the baby was referred to the baby clinic at the hospital from her own baby health centre, as she had not regained her birth weight at the age of eleven weeks. The mother said that the baby was always sleepy; she was a good baby, but was difficult to feed. The mother's

breast milk had failed, as the baby would not take it. The baby was receiving modified milk in the proportion of 1:1, never taking more than three ounces at a feed, and had been constipated since birth. The mother was very worried, as she had lost a previous child at the age of ten months with leuchæmia. On examination, the baby was pale and lethargic, with open mouth, thick protruding tongue, round wide-set eyes and a dry and scaly skin. Apart from the vague mongoloid appearance, there was no other evidence of mongolism. The abdomen was distended, and a small umbilical hernia was present. The baby was admitted to hospital and given a diet of high Calorie content, but was extremely difficult to feed. Thyreoid tablets (one-eighth of a grain) were given daily, the dosage being slowly increased to half a grain three times a day at the end of a month, with great improvement in the amount of food taken and in the general condition of the baby. On February 10 the mother reported to the baby clinic, and spontaneously remarked that the baby's skin had stopped peeling and was not brownish any more. She also remarked that the baby looked different and kept her tongue in. Two weeks later the baby was one pound over her birth weight, and she was taking her food well. She had a severe attack of gastro-enteritis at the age of four and a half months. By the beginning of April her weight was 13 pounds 8·5 ounces. She was too alert, refusing her 10 p.m. feed and not sleeping well. She was not sleeping during the day, but was good and did not cry. There was no tachycardia, but the gain in weight was not satisfactory, so the dosage of thyreoid was reduced to half a grain of dried thyreoid twice a day. The baby progressed well for six weeks. Her weight increased to 15 pounds four ounces by the age of six months. She then began waking at night and refusing to sleep, and the thyreoid dosage was again reduced to a quarter of a grain three times a day, with good results. The baby was also receiving ascorbic acid, 25 milligrammes twice a day, ferrous sulphate, 4·5 grains per day, and a good mixed diet. Examination of the mother revealed the presence of an enlarged thyreoid, but no evidence of either myxœdema or thyreotoxicosis. She said that she had had periods of sudden weight gain and loss, but was otherwise well. The comment was made that the change in appearance of the baby had been noticeable since she had been receiving dried thyreoid. Her progress was normal mentally and physically. The only guide to dosage had been her clinical condition. X-ray examination of the bones had not been helpful. The dose had been reduced twice at the first appearance of toxic symptoms, those being taken as failure to gain weight, restlessness and failure to sleep. The thyreoid tablet administered was dried thyreoid of the 1948 British Pharmacopœia, synonym *Thyreoideum Siccum*.

Congenital Heart Disease.

Dr. Isbister and Dr. Webb then discussed a series of cases of congenital heart disease from the obstetric department of the hospital. The first case was that of a baby, who had collapsed and died unexpectedly at the age of two days. He was a peculiar-looking child with sparse fine hair; the subcutaneous fat was unevenly distributed, being apparently absent in places; the eyes were set wide apart. The baby was very lethargic, and became jaundiced on his second day. His testicles were undescended, and his penis was very small. The right foot was persistently cyanosed. A loud systolic and diastolic murmur was audible all over the precordium. He had a cyanotic attack during the night prior to the day of his death, but recovered, and his condition appeared satisfactory. *Post mortem* the baby was found to have multiple congenital abnormalities, including coarctation of the aorta, an abnormal mesentery and undescended testicles. Despite exhaustive questioning, the mother said that she was sure that she had had no illness or hæmorrhage during pregnancy, and that there was no family history of congenital abnormalities.

The next baby discussed had had a normal birth on December 28, 1949, and at birth had appeared normal. He was lethargic and difficult to feed, and responded well to the administration of thyreoid tablets, one-eighth of a grain per day, for a few days. He was fully breast fed, and progressed satisfactorily for two months; then he was brought to the night casualty department, having collapsed after a breast feed which he vomited. He was noticed to be pale, and his condition was thought by the resident medical officer to be due to feeding difficulties. Two similar attacks occurred during the next month, neither of long duration; but on March 28, 1950, the baby had a severe attack again following a feed, became very pale and collapsed, lost consciousness and was sent to hospital for urgent admission. On examination at that time the baby was pale and collapsed and semi-conscious, but could be roused. The pulse rate was 180 per minute; but when the baby was roused it increased to 200 to 300 per minute and was uncountable. No murmurs were audible in the heart. The periods of rapid rate lasted for ten to twenty seconds and then the rate was approximately halved. A diagnosis of paroxysmal tachycardia was made. In hospital the baby was fed on expressed breast milk with one breast feed daily. One mild attack was observed after a feed, and a severe attack occurred early one morning, so no electrocardiogram was prepared. The baby was given quinidine, 0·5 grain three times a day, starting with a quarter of a grain and working up to the full dose. He had attended the baby clinic regularly since his discharge from hospital and there had been no further attacks. Progress had been satisfactory, and the quinidine dosage had been reduced to half a grain twice a day. The comment was made that the baby had had attacks of paroxysmal tachycardia apparently following exertion and responding to quinidine therapy. There had been no evidence of congenital heart disease, but the history was probably significant.

Dr. Isbister and Dr. Webb then showed a baby who had been born in June, 1949. Cyanosis was noticed a few hours after the baby's birth, but no cardiac murmur was audible. On the fifth day a loud systolic murmur was audible over her pulmonary area, and the heart appeared enlarged on clinical examination. Subsequently she had made good progress, taking her food well, and had gained weight normally. There had been no respiratory distress. Cyanosis was always present, but was greater when she cried, and at times was of considerable degree only in her finger nails. There was early clubbing of the fingers. On examination of the baby the heart appeared to be enlarged, and a systolic murmur was present in all areas. Her mother looked after her extremely well and precautions were taken to avoid exposure to infection; but otherwise she lived a normal life, even to the extent of going camping with her parents. X-ray examination of the heart was carried out soon after the baby's birth, and the radiologist made the following report:

> Cardiac shadow much enlarged particularly in the right hemithorax, where appearance suggests a right auricular enlargement. I would say that there is a congenital malformation. There is no evidence of enlarged thymic shadow.

A further X-ray examination three months later revealed that the heart was enlarged towards both sides, but the appearances were inconclusive at that stage. The comment was made that the baby was progressing satisfactorily, and that it was too early yet to give a prognosis or to make a definite diagnosis.

In the light of the last-mentioned patient the subject of persistent cyanosis from birth and congenital cardiac defects was discussed in some detail.

Carcinoma of the Vulva.

DR. OSSIAN ROBERTSON showed a woman, aged eighty-five years, who had been admitted to hospital on May 11, 1950, complaining of soreness of the vulva present for twelve months with a sanious discharge. She was married, but had had no children. Her menopause had occurred thirty-five years previously. On examination of the patient an ulcerating neoplasm was found measuring approximately two inches by one inch and involving the medial aspect of the right *labium majus*. Vulvectomy was carried out on May 25. The post-operative period was free of discomfort to the patient, though the maintenance of efficient dressings was a problem to the nursing staff.

Hydatidiform Mole with Possible Chorionepithelioma.

DR. STUART B. STUDDY showed a married woman, aged twenty-six years, who had been admitted to hospital on December 12, 1949, with a diagnosis of threatened miscarriage. The hæmorrhage ceased, and she was discharged from hospital one week later. Luteal cysts were then palpable. The patient had one child, aged three and a half years, and had had no previous miscarriages. Her last menstrual period had been in September, 1949. On December 23 she was again admitted to hospital with vaginal hæmorrhage. X-ray examination on December 29 revealed a soft tissue mass corresponding to the size of a five to six months pregnancy, but with no evidence of any fœtal parts. On January 1, 1950, the patient aborted a typical hydatidiform mole, and on January 9 she was discharged from hospital. On January 28 she was again admitted to hospital with a history of vaginal hæmorrhage of two days' duration. Curettage of the uterus was carried out, and the pathologist reported that evidence of subacute inflammation was present

in the material obtained. The vessels were more prominent than normal, and some of the stromal cells had decidua-like changes. One small piece of hydatidiform mole was present, which looked benign. The patient was discharged from hospital on February 5, 1950. The result of an Aschheim-Zondek test on February 7 was positive with undiluted urine, negative with urine diluted 1:50 and 1:100. The result of a test in March was positive with a dilution of 1:50. The patient was again admitted to hospital in April, 1950, with vaginal hæmorrhage. Curettage was again performed, and the pathologist reported that no chorionic cells were seen in sections of the pieces of endometrium obtained, nor were there any decidual changes. An active inflammatory condition was present with fairly heavy infiltration of lymphocytes and plasma cells and some fibrous changes. The result of an Aschheim-Zondek test was positive with dilutions of 1:50 and 1:100. In June the result of an Aschheim-Zondek test was negative.

Squamous Cell Carcinoma of the Body of the Uterus.

Dr. Studdy's second patient, a married woman, aged fifty-nine years, had been admitted to hospital on May 5, 1950, with a history of profuse brownish vaginal discharge since the middle of the previous month. She had suffered from listlessness for three to four months. She had had one child at the age of twenty-one years, one miscarriage at the age of twenty-three years, and the menopause had occurred at the age of thirty-nine years. Curettage and cervical biopsy were carried out. The pathologist reported that sections from the cervical biopsy showed only granulation tissue; no cancer cells were seen. The curettage material was mostly necrotic tissue, but it did contain groups of cancer cells which had a squamous arrangement suggesting that the growth might have started in the cervix. One week later total hysterectomy was carried out. Pathological examination revealed that macroscopically the endometrium appeared thickened and pale. Microscopic examination revealed a squamous carcinoma of the body of the uterus extending over a considerable part of the endometrium and deep into the muscle. The section of the cervix showed evidence of chronic inflammation, but no sign of carcinoma.

Leucoplakia Vulvæ.

DR. EDMUND COLLINS showed a married woman, aged fifty-nine years, who had been admitted to hospital on May 15, 1950, with a history of irritation and discharge from the vulva for six months. She had had two children, and the menopause had occurred at the age of forty-two years. On examination of the patient, an area of leucoplakia was found involving the vulva and both inguinal folds, extending posteriorly and surrounding the anus completely. Vulvectomy was carried out with very wide excision including the inguinal folds. The patient was comfortable throughout convalescence, with the exception of the first four days, when some pain was felt from skin traction by the sutures. The pathologist reported that examination of sections showed that the epidermis was thin, and the connective tissue beneath was hyaline and contained few fibres or nuclei. The specimen was an example of the so-called atrophic stage of leucoplakia. No malignant change was found.

A MEETING of the New South Wales Branch of the British Medical Association was held at the Lewisham Hospital, Lewisham, on August 24, 1950. The meeting took the form of a series of clinical demonstrations by members of the honorary medical and surgical staff of the hospital.

Ruptured Kidney.

DR. ALBAN GEE presented a young man, aged sixteen years, well developed for his age, who had been admitted to hospital the day after he had been knocked out at football by a blow on the left loin. Hæmaturia was at first brisk, but later lessened, and he was fairly comfortable when first examined nearly forty hours after the injury. An excretion urogram had revealed a normal appearance on the right side, but on the left side only a few faint patches of drug could be seen. His pulse rate remained at about 90 per minute, but there was considerable tenderness and some bulging in the left loin, with well-marked guarding in this area and in the left hypochondrium. At cystoscopic examination free blood could be seen coming from the left ureteric orifice, and a pyelogram revealed a large irregular collection of the injected material overlying the last rib. A ruptured kidney with considerable extravasation was diagnosed, and this was confirmed at operation. A large hydronephrotic kidney, measuring seven inches by four inches, was removed. There was one tear nearly two inches long through a large dilated middle calyx, and the lower one-third of the kidney was nearly severed. The patient made an uneventful recovery.

In discussing this case, Dr. Gee remarked that some concurrent abnormality of the kidney, or of its bony surroundings, was frequently present when kidneys were torn. In this case a large hydronephrotic thin-walled kidney was present with a considerable portion unprotected by the bony thoracic cage. An excretion urogram should always be taken in cases of suspected renal injury, if only for the help it gave in the delineation of the uninjured side. However, it frequently also gave very valuable information about the traumatized organ, which could then be confirmed more accurately by retrograde pyelography. There was little danger of increasing the bleeding by the latter procedure, and if careful precautions were taken there should be no risk of introducing infection. It should be realized that the extent of the hæmaturia was not a reliable guide as to the severity of the injury, and the clinical picture was more important.

Seminoma of the Testis.

Dr. Gee's next patient was a man, aged eighty-one years, who had been admitted to hospital in September, 1948, suffering from acute retention of urine. The prostate on rectal examination was found to be considerably enlarged, and the left lobe a little firmer than normal. A suprapubic prostatectomy with primary closure of the bladder after the Harris technique was performed. The pathological report was that a highly differentiated carcinoma was present. The patient was ordered stilbœstrol, and had continued to take 10 milligrammes daily ever since. Nearly twenty months after the operation, he reported to hospital with a swollen left testis. He was sure that it was of a fairly recent origin, was quite painless, and was increasing in size. The testes had been noted as normal at the original examination, but there was a left inguinal hernia which descended into the scrotum. The testis was seen to be about three times its normal size, firm and heavy, and lacking in sensation. It was not associated with the hernia. A left simple orchidectomy was performed, and deep radiation applied to the area.

Dr. Gee said that the interest in the case lay firstly in the advanced age at which the seminoma appeared, and secondly in the possible role the continuous stilbœstrol ingestion might have played. There was some evidence to show that the Sertoli cells secreted œstrogen, and seminomata appeared to be associated with the production of a follicle-stimulating hormone like that found in castrates' urine, while the amount of androgenic hormone was diminished.

Bilateral Ectopic Ureters.

Dr. Gee's third patient was a girl, aged six years, who was incontinent of urine day and night. The condition had been first noticed at about the age of two years, when the mother tried to train her to do without "nappies". At times she would pass a quantity of urine, but she was always wet and the urine appeared to drip from her continually. On examination of the patient, urine could be seen dribbling from the external meatus, and a distinct jet appeared with coughing. An excretion urogram showed a normal right urinary tract, but there was dilatation of the left renal pelvis and of the left ureter, particularly at its lower end. At cystoscopic examination, the bladder was found to be quite normal. About the middle of the urethra on the left side, there was a small opening, which, by catheterization, was proved to be the left ureteric orifice. A pale blue colour was seen after the injection of indigo carmine. Just inside the urethra, at about the seven o'clock position, there was a similar opening on the right side. That was proved to be the right ureteric orifice, and a normal blue specimen was collected. No orifices could be seen in the bladder, and no trigone was present. X-ray pictures were taken with the catheters in place, and they were seen to remain well separated until approximated below the symphysis, in the urethra. Transplantation of the left ureter into the bladder was then performed. The bladder was opened, and on the suggestion of Dr. Richard Harris, a finger was inserted into the vagina to lift the ureter forward. The ureter had previously been catheterized, and the catheter could be felt from the bladder mucosal surface. An incision was made directly over it, and when cleared, it was tied off as low down as possible and divided. The cut end was then sutured without any tension to the bladder mucosa, and the bladder

closed over a suprapubic drain. The patient was discharged from hospital three weeks later, having been dry for the previous few nights and well during the day, except for some urgency.

Dr. Gee said that at the present stage it was not possible to state whether a further operation would be necessary on the right ureter, but it was possible that urine from that side might flow back into the bladder. The condition found in the case under discussion was an extremely rare one, in that only three cases had been reported in the literature in which bilateral single ectopic ureters had both opened in the urethra. A single ectopic ureter opening in that position was not rare, though uncommon, and usually drained the upper component of a double kidney. The children so affected must be distinguished from the enuretics, who were not wet all the time, and had voluntary control when conscious.

Double Ureters.

Dr. Gee's last patients were two girls, aged nineteen and twenty-five years respectively, in each of whom had been found a congenital abnormality of the upper part of the urinary tract. In the first, complete double kidneys and ureters were present on each side, the ureters crossing each other in two places, as was usual in that condition. The ureter from the upper pole of the kidney opened at the lower medial orifice in the bladder.

The second girl had also a double collecting system on her left side, but the ureters did not cross at any point, and the upper pole ureter opened into the bladder at a slightly higher level and medial to that from the lower pole. The condition was very rare and was difficult to explain embryologically, but it was without pathological significance.

A MEETING of the Victorian Branch of the British Medical Association was held on August 26, 1950, at the Gippsland Base Hospital, Sale. The meeting in the afternoon took the form of a series of clinical demonstrations by members of the honorary medical and surgical staffs of the hospital; in the evening Dr. J. S. Peters read a paper entitled "Urological Problems in General Practice".

Bronchiectasis following Pertussis.

DR. G. J. B. BALDWIN presented a girl, aged nineteen years, who had always had a cough since an attack of pertussis at the age of six months. She had been examined by Dr. N. F. Prescott and had had some 20 antral washouts, but lung disease was suspected and a plain X-ray picture of the chest had been suggestive of bronchiectasis. A bronchogram had then been carried out. Dr. Baldwin demonstrated the films, which showed bilateral basal bronchiectasis. He explained that the patient did not look well, although only a few râles could be heard at the lung bases. Clubbing of the fingers was present. Postural drainage was at present being carried out.

DR. L. P. WAIT said that he considered that very little could be done at the present stage, as the condition was widespread and bilateral. He asked whether the patient had had any physiotherapy before having the bronchogram. With regard to the antral washouts, he thought that they would make no difference to her present condition. Surgery would be contraindicated, but postural drainage might be helpful.

DR. J. M. BELL asked Dr. Wait what measures should be taken in children with pertussis or measles to guard them against developing bronchiectasis. Dr. Wait said that the convalescent period was very important for the children under discussion and that they often developed lobular collapse; in that case postural drainage, physiotherapy and chest exercises were most useful.

DR. J. SEWELL considered that aerosol penicillin and streptomycin might be helpful. In his experience he had found them so, but often the particle size was too large.

Head Injury.

Dr. Baldwin's second patient was shown in conjunction with DR. O'BRIEN. The patient was a young Royal Australian Air Force aircraftsman, who had had a fairly severe motorcycle accident some six weeks previously. He had suffered a contusion around the right eye, a severe laceration in the mouth, and a leg injury. The mouth wound was sutured and the gravel rash on the face cleaned up. He went back to his unit, but four or five days later complained of difficulty in moving his right arm. Movement was found to be full and no abnormal neurological signs could be detected, but fine movements, such as writing, could not be carried out. A week later he stated that he had double vision, and Dr. Baldwin then referred him to Dr. O'Brien.

Dr. O'Brien demonstrated the characteristic position of the head to overcome the diplopia. He considered that accident cases of the type discussed were becoming commoner. The patient had really seen double as soon as he was well enough to note it. The injury was to the right side of the head, but the muscle affected was the left superior oblique. Dr. O'Brien explained that the condition could be improved by operation in four to six months' time, if the lesion had not become less by then. The injury was probably to the nerve trunk inside the cranium, and there was no evidence of optic nerve damage or fracture of the skull.

DR. J. A. GAME suggested that the hand weakness might be the result of a degree of cerebral laceration. Epilepsy was, of course, a second possibility that must be borne in mind.

Disseminated Chorioiditis.

Dr. O'Brien's second patient was a woman with active disseminated chorioiditis in both eyes. Visual acuity in the right eye was less than 6/60, with a macular lesion present; in the left eye visual acuity was about 6/9. The condition was non-specific, as there was no evidence of syphilis. The only evidence of a septic focus was to be found in some very carious teeth.

DR. J. SEWELL asked if patients of the type shown were commonly syphilitic and if they all received antisyphilitic treatment.

Dr. O'Brien thought that as a rule antisyphilitic treatment was given mainly in an attempt to do something for the patient.

Muscle Atrophy.

DR. J. M. BELL then presented three patients with muscle atrophy. The first patient, a man of middle age, had developed wasting of his interossei following shooting pains down the ulnar border of the right hand. Dr. Bell demonstrated the wasting and lack of muscle tenderness. The opposite hand was also slightly involved and the thenar muscles were wasted. No wasting or fibrillation of the shoulder muscles was noted and no sensory changes, but subjective numbness of the hands was present. No vascular or trophic changes were seen. X-ray examination of the neck region showed no evidence of a cervical rib.

DR. M. KELLY said that the case offered difficulties in diagnosis. At first he had thought the condition was like progressive muscular atrophy, but peripheral nerve lesions of the hand could give a similar picture, and he believed that the latter was the correct diagnosis.

DR. J. A. GAME agreed with Dr. Kelly. He said that pain was unknown in progressive muscular atrophy and in the case under discussion there was also some sensory disturbance. Therefore the case might be one of a peripheral nerve injury or a thoracic outlet syndrome. Not all cases of the latter condition were related to a cervical rib, and the diagnosis might finally have to rest with an exploratory operation.

Dr. Bell, in reply, said that he had believed that the onset of progressive muscular atrophy might be with severe pain before weakness and wasting occurred.

Dr. Bell's second patient was a man, aged sixty-three years. Wasting of the lower limbs had been noticed first when he was aged thirteen years, and he had had shooting pains down both legs for many years. More recently his arms had become involved, with wasting of the abductors and triceps. There was no sensory loss, and fibrillation had been noted around the shoulder girdle. Dr. Bell considered the patient to be suffering from progressive muscular atrophy. The cerebro-spinal fluid was normal and the Wassermann test and colloidal gold curve provided no evidence of syphilis.

DR. M. KELLY thought the patient's condition was similar to a median nerve lesion. Such lesions were not uncommon, and Ramsay Hunt had written about the thenar and hypothenar muscular atrophies.

DR. J. A. GAME considered the case interesting. He thought that it was one of muscular dystrophy; the history of onset in childhood and symmetrical proximal wasting were in favour of that. Also the gradual course was fully in keeping with the diagnosis.

Dr. L. P. WAIT congratulated Dr. Bell on his cases. He mentioned that sometimes the condition in the type of case

under discussion was misdiagnosed and the patient was treated as having poliomyelitis.

Dr. Bell's third patient was a middle-aged man who had been first examined twelve months before. The patient stated that after cracking a whip he had developed a pain in the left arm and later wasting of the triceps and forearm muscles. He had been given a course of injections into the left arm, but those did not help him. At the present time there was also some sensory loss over the mid-dorsum of the hand. The results of X-ray examination of the neck and lumbar puncture were normal, and the result of a Wassermann test was negative. Dr. Bell left the case open for discussion.

DR. M. SALVARIS said that he had treated the patient originally. He had given him various drugs and finally a series of vitamin B_1 injections into his affected arm. Dr. Salvaris thought that that might have been unfortunate, but at the time he was unaware of the lesion.

DR. M. KELLY pointed out that conditions similar to the one under discussion were encountered in the army during the recent war. They sometimes followed trauma. He felt that the prognosis was good—about 80% of those affected recovered. Similar conditions were said to follow various inoculations, and the prognosis there was also good. Dr. Kelly thought that the differential diagnosis from poliomyelitis might sometimes be difficult.

DR. J. A. GAME felt that the condition was one of dislocated cervical disk (although that diagnosis was at present in disfavour), and in his opinion all the signs were confined to the seventh cervical nerve root. He thought that it was rather late to do anything about it, and in any case no pain and very little disability remained.

Volvulus due to Constricting Band.

DR. C. V. CHILDS presented a married woman who had recently complained of lower abdominal pain. There was tenderness with muscle guarding in the right iliac fossa. Plain X-ray examination of the abdomen showed only dilated bowel, and laparotomy was performed. At operation a volvulus was found. The specimen was demonstrated at the meeting. It was some fifteen inches long and extended to the ileo-caecal valve. The volvulus was caused by a band, one and a half inches long by one-quarter of an inch across, constricting the bowel across the mesentery. The patient had been given "Chloromycetin" post-operatively and was very well.

Torsion of the Testicle.

DR. N. F. PESCOTT presented a boy, aged twelve years, who had developed pain in the left testicle some four weeks before. There was no history of injury, but the pain continued and the testicle became swollen. Dr. Pescott had examined the boy first three days after the onset of symptoms, and at that time the boy had a greatly enlarged testicle—about two fists in size; and it was red and œdematous, but very little pain was then present. Dr. Pescott thought that the diagnosis was probably one of torsion of the testicle, and he decided to treat the patient conservatively with bed-rest and penicillin. The swelling had gradually subsided and the testicle was at the time of the meeting only about twice the size of the other one. Dr. Pescott wondered whether a torsion of the testicle could subside like that.

DR. LEONARD BALL thought that the condition must be one of torsion of the testicle (since there was no history of injury), and that it had untwisted. He thought that some degree of hydrocele might be present.

DR. J. S. PETERS also believed that the condition was one of torsion, and that the prognosis was good.

Senile Gangrene.

Dr. Prescott's second patient was an old woman whom he had examined at her home four weeks before, when she was complaining of severe headache and inability to speak. He had found her to have auricular fibrillation; central nervous system examination revealed nothing abnormal except that her speech was limited to "yes" and "no". He diagnosed her condition as being due to cerebral embolus and treated her with rest and digitalis therapy. Her heart stopped fibrillating, but seven days later she complained of severe pain in the right leg. The leg was found to be cold and gradually became blue. Dr. Pescott considered that she had had a further embolus. He had tried all the remedies to relieve the pain, including intravenous administration of procaine (80 millilitres every twenty minutes for three days), morphine, pethidine *et cetera*, but all to no avail.

DR. LEONARD BALL considered the condition was either embolism or senile gangrene. If it was the former it would be at the popliteal bifurcation, and he thought that gangrene would have occurred earlier. Therefore he thought that it was most likely to be senile gangrene. As to treatment, he suggested that amputation should be carried out at once, above the knee, and after refrigeration.

DR. J. SEWELL noted that the patient's calf was very tender and thought that probably deep venous thrombosis was present. He had found that the use of dicoumarol in such cases sometimes relieved the pain—he did not know why. X-ray examination of the leg might be helpful in showing calcification of the arteries.

Dr. Pescott explained that the patient was at present under dicoumarol treatment.

Diverticulitis.

DR. D. I. FITZPATRICK then presented five patients with diverticulitis. The first was a woman, aged seventy years, with a history for three weeks of lower abdominal pain and frequency and scalding of micturition. She had been found to have a pelvic abscess, which was drained *per rectum*. Three weeks later a sigmoid colostomy was carried out after laparotomy, performed because of a suspected appendicular attack. At a third operation the spur was clamped.

The second patient was a woman, aged sixty-one years. She had a three-years history of diarrhœa and abdominal pain. She was diagnosed as suffering from intestinal obstruction. At operation diverticulitis was found, and a colostomy was performed.

The third patient, a woman, aged seventy-two years, had been admitted to hospital with a diagnosis of general peritonitis. At operation perforated diverticulæ were seen; a transverse colostomy was carried out with drainage through the pelvis. The colostomy had since been closed and her bowels were acting well.

The next patient was a man, aged fifty-two years, with a history of acute abdominal pain. Laparotomy showed perforated diverticula on the sigmoid colon, and a transverse colostomy was carried out with drainage. He had since needed a further operation to free adhesions.

Dr. Fitzpatrick's last patient was a man, aged fifty-eight years. He had been diagnosed as suffering from subacute intestinal obstruction, which was thought to be due to malignant disease. He had a past history of intestinal obstruction and diverticulitis; at that time a pelvic abscess had been found and drained *per rectum*.

Dr. Fitzpatrick considered that the patients presented showed the importance in diagnosis of pyrexia, the findings from rectal examinations and the history of lower abdominal discomfort or pain. He went on to stress the importance of chemotherapy in such cases, especially the exhibition of penicillin, streptomycin and succinyl sulphathirsolate. He wished to ask the meeting whether the colostomy should always be a transverse one, how long the colostomy should be left open, how soon after operation the bowel should be opened, and how important was Sudeck's critical point in the carrying out of a colectomy.

DR. LEONARD BELL said that symptoms often subsided after colostomy, but were liable to recur with closure. He considered that with localized diverticula the best treatment was a transverse colostomy followed by excision of the affected area. He had found the mortality higher than in cases of carcinoma, but modern chemotherapy should improve that. The importance of Sudeck's critical point had been greatly overstressed. Regarding the colostomy itself, it was best to perform a transverse one, and the bowel could then be opened at any time.

Correspondence.

THE INDICATIONS FOR SPLENECTOMY: A DISCUSSION OF SOME MECHANISMS INVOLVED IN SPLENOPATHIES.

SIR: Dr. C. R. B. Blackburn is to be congratulated upon his treatment of the surgical splenopathies (THE MEDICAL JOURNAL OF AUSTRALIA, October 28, 1950). This very good article with lucid diagrams presents a muddled and complicated subject in simple form, and is another step in the gradual clearing of the heavy haze around the spleen and its physiology.

The concept of hypersplenism emanates from the United States, in the clinics of Doan, Wright and co-workers, and—

separately—of Dameshek. The concept has the virtue of simplicity, in that it pictures an overaction of the splenic function resulting from a splenic hyperplasia. This hyperplasia in its turn is: (i) idiopathic (thrombocytopenia, pancytopenia *et cetera*); (ii) inflammatory (kala-azar, malaria *et cetera*); (iii) congestive (portal hypertension); (iv) possibly reactionary, in the case of strange disorders of the reticuloendothelial system such as the storage reticuloses (Gaucher's disease).

Where, then, do Hodgkin's disease and the leuchæmias come into this? I wish to plead that they probably do not come in at all, because they are not hyperplasias, but malignant neoplasias which work their evil solely by tissue replacement, destruction or pressure.

I think the American literature exhibits even more confusion than the English in the matter of the histogenesis and the fundamental nature of leuchæmic and Hodgkin's tissue cells, so that from time to time and fairly regularly one reads such things as this:

"A secondary state of panhæmocytopenia may occur in association with other processes involving the spleen, such as Hodgkin's disease and Gaucher's disease. We have had one example of the latter condition in which splenectomy brought about prompt improvement of the abnormal blood picture" (*Surgical Clinics of North America, Lahey Clinic*, June, 1948).

But Gaucher's, surely, is as much different from Hodgkin's as is chalk from cheese. So, one is urged to wonder exactly how many cases of proven Hodgkin's disease have been subjected to splenectomy, and with exactly what effect on the blood picture that would last longer than that of the operation transfusions.

Much the same as all this applies to leuchæmia, so that it seems to me rather a pity that the little diagram representing this malignant disease of hæmopoietic tissue should be placed between those for hypersplenism and myelofibrosis.

I would be interested to know Dr. Blackburn's opinion on these views, which are those of a relatively uninstructed surgeon who is uncertain of the true significance and value of a reaction such as the Coombes test. Much reliance is placed on this test in some surgical centres of the United States in the differentiation between familial and acquired acholuric jaundice, but what conclusions are reasonably to be drawn from its positivity in some cases of Hodgkin's disease is, to say the least, dubious.

Please allow me once more to compliment Dr. Blackburn on an instructive, academic and in all ways praiseworthy article.

Yours, etc.,
J. K. MOWAT, M.S.

Brisbane,
October 30, 1950.

OCULAR MANIFESTATIONS OF SARCOIDOSIS WITH A DESCRIPTION OF SEVEN CASES.

SIR: I was interested to read the article by Miss N. Lewis on sarcoidosis of the eyes, as I have never been able to diagnose this condition. Would Miss Lewis state the criteria she uses to diagnose sarcoidosis? Also would she state if the criteria conform to Koch's postulates?

I do not believe that sarcoidosis as a separate entity exists.

Yours, etc.,
F. SIMPSON, D.O. (Oxon).

105 St. George's Terrace,
Perth,
October 20, 1950.

Post-Graduate Work.

THE POST-GRADUATE COMMITTEE IN MEDICINE IN THE UNIVERSITY OF SYDNEY.

Lecture-Demonstration at Balmoral Naval Hospital.

THE Post-Graduate Committee in Medicine in the University of Sydney announces that Dr. W. Wilson Ingram will discuss "The Diagnosis and Treatment of the Glycosurias" on Tuesday, November 14, 1950, at 2 p.m., at the

DISEASES NOTIFIED IN EACH STATE AND TERRITORY OF AUSTRALIA FOR THE WEEK ENDED OCTOBER 21, 1950.[1]

Disease.	New South Wales.	Victoria.	Queensland.	South Australia.	Western Australia.	Tasmania.	Northern Territory.[2]	Australian Capital Territory.[2]	Australia.[3]
Ankylostomiasis	*	..	3	..	..	..	..	..	3
Anthrax	*	..	..	..	..	..	..	..	..
Beriberi	*	*	*	*	*	*	..	*	..
Bilharziasis	*	..	..	..	..	..	..	..	..
Cerebro-spinal Meningitis	3	2	3(1)	..	1	..	..	..	9
Cholera	..	..	..	..	..	..	..	..	..
Coastal Fever(*a*)	*	*	..	*	*	*	*	*	..
Dengue	*	*	*	*	*	*	..	*	..
Diarrhœa (Infantile)	..	..	4	..	..	..	..	..	4
Diphtheria	7(4)	5(5)	5(4)	..	2(2)	..	..	..	19
Dysentery (Amœbic)	*	1(1)	..	..	..	..	..	..	1
Dysentery (Bacillary)	*	..	2	..	1(1)	..	..	..	3
Encephalitis Lethargica	..	..	..	..	..	..	..	..	..
Erysipelas	*	*	*	2(2)	*	*	..	..	2
Filariasis	*	..	..	..	..	..	..	..	..
Helminthiasis	*	..	*	*	*	*	*	*	..
Hydatid	*	..	*	..	*	*	*	..	..
Influenza	*	*	*	..	*	*	..	*	..
Lead Poisoning	*	*	..	*	*	*	*	*	..
Leprosy	..	..	..	..	15	..	..	..	15
Malaria(*b*)	*	1	..	..	..	..	..	..	1
Measles	*	*	*	425(192)	*	*	..	..	425
Plague	..	..	..	..	..	..	..	..	..
Poliomyelitis	15(8)	1(1)	3	4(2)	..	..	..	..	23
Psittacosis	*	..	*	..	*	*	*	*	..
Puerperal Fever	..	..	..	..	..	..	..	..	..
Rubella(*c*)	..	*	*	*	..	*	..	..	..
Scarlet Fever	13(8)	32(12)	13(12)	7(6)	5(3)	..	..	..	70
Smallpox	..	..	..	..	..	..	..	..	..
Tetanus	*	1(1)	..	*	*	*	*	*	1
Trachoma	*	..	*	*	*	*	*	*	..
Tuberculosis(*d*)	25(19)	33(17)	7(4)	4(2)	5(3)	3	..	..	77
Typhoid Fever(*e*)	..	..	..	..	..	..	..	..	..
Typhus (Endemic)(*f*)	1	..	2	..	..	..	..	..	3
Undulant Fever	..	2	..	..	..	..	..	..	2
Weil's Disease(*g*)	*	*	3	*	*	*	*	*	3
Whooping Cough	*	*	*	3(1)	*	*	..	..	3
Yellow Fever	..	..	..	..	..	..	..	..	..

[1] The form of this table is taken from the *Official Year Book of the Commonwealth of Australia*, Number 37, 1946–1947. Figures in parentheses are those for the metropolitan area.
[2] Figures not available.
[3] Figures incomplete owing to absence of returns from the Northern Territory and Australian Capital Territory.
* Not notifiable.
(*a*) Includes Mossman and Sarina fevers. (*b*) Mainly relapses among servicemen infected overseas. (*c*) Notifiable disease in Queensland in females aged over fourteen years. (*d*) Includes all forms. (*e*) Includes enteric fever, paratyphoid fevers and other Salmonella infections. (*f*) Includes scrub, murine and tick typhus. (*g*) Includes leptospiroses, Weil's and para-Weil's disease.

Balmoral Naval Hospital, Balmoral. After afternoon tea, clinical cases will be presented at 4 p.m. All members of the medical profession are invited to attend.

Course for Part II Diploma in Ophthalmology.

A twelve weeks' course for Part II of the diploma in ophthalmology will be held over the periods December 4 to 15, 1950, and January 8 to March 16, 1951. Fee for attendance will be £31 10s. and enrolment should be made with the Course Secretary of the Committee, 131 Macquarie Street, Sydney.

Course for Part II Diploma in Gynæcology and Obstetrics.

Provided candidates are offering, a course for Part II of the diploma in gynæcology and obstetrics will be held over a period of twelve weeks from December 4 to 15, 1950, and January 8 to March 16, 1951. Intending candidates are asked to note that the closing date for applications is November 24, 1950.

Course in Advanced Surgery.

Provided a sufficient number of candidates is offering, it is proposed to hold a course in advanced surgery from January 8 to March 16, 1951, occupying five afternoons each week. The course will be as complete as is possible over the ten weeks' period. Intending candidates are asked to note that the closing date for applications is November 24, 1950.

Course for Part II Diploma in Laryngology and Otorhinology.

The committee is endeavouring to ascertain whether any candidates would be offering for a course for Part II of the diploma in laryngology and otorhinology, to be held over a period of ten weeks beginning January 8, 1951. Those interested in attending are requested to communicate with the Course Secretary, the Post-Graduate Committee in Medicine, 131 Macquarie Street, Sydney, not later than November 24, 1950. Telephones: BU 5238, BW 7483.

Obituary.

HENRY HOLLISTER JACKSON.

WE regret to announce the death of Dr. Henry Hollister Jackson, which occurred on October 24, 1950, at Richmond, Victoria.

ARTHUR GEORGE EYRE NAYLOR.

WE regret to announce the death of Dr. Arthur George Eyre Naylor, which occurred on October 23, 1950, at Caulfield, Victoria.

Congresses.

FIFTH CONGRESS OF THE PAN-PACIFIC SURGICAL ASSOCIATION.

THE fifth congress of the Pan-Pacific Surgical Association will be held in Honolulu from November 10 to 21, 1951.

The object of the Pan-Pacific Surgical Association is to bring together surgeons from countries bordering on the Pacific Ocean, so as to permit the exchange of surgical ideas and methods and to develop a spirit of good fellowship among the various races represented. Although it was planned that meetings would be held every three years, world events have permitted but four conferences since the organization was conceived—the first in 1929 and the last in 1948.

The fifth congress provides an opportunity for doctors to combine a vacation in Hawaii with attendance at a scientific meeting, the programme of which will be presented by leading surgeons from the Pacific area countries, as planned by the programme committee. Doctors are urged to bring their families with them and are promised luxurious accommodation. For further information concerning the conference, doctors are requested to write to Dr. F. J. Pinkerton, President of the Association, Young Hotel Building, Honolulu, Hawaii, or to Dr. Keith Kirkland, chairman for Australia, 137 Macquarie Street, Sydney.

Nominations and Elections.

THE undermentioned have applied for election as members of the New South Wales Branch of the British Medical Association:

Cahill, Brian Peter, M.B., B.S., 1948 (Univ. Sydney), Saint Vincent's Hospital, Darlinghurst.

Broadfoot, Eric Murray, M.B., B.S., 1950 (Univ. Sydney), 569 Malabar Road, Maroubra Bay.

Diary for the Month.

Nov. 13.—Victorian Branch, B.M.A.: Finance, House and Library Subcommittee.
Nov. 14.—New South Wales Branch, B.M.A.: Executive and Finance Committee.
Nov. 15.—Western Australian Branch, B.M.A.: General Meeting.
Nov. 16.—Victorian Branch, B.M.A.: Executive Meeting.
Nov. 21.—New South Wales Branch, B.M.A.: Medical Politics Committee.
Nov. 22.—Victorian Branch, B.M.A.: Council Meeting.
Nov. 23.—New South Wales Branch, B.M.A.: Clinical Meeting.
Nov. 24.—Queensland Branch, B.M.A.: Council Meeting.
Nov. 28.—New South Wales Branch, B.M.A.: Ethics Committee.
Nov. 30.—New South Wales Branch, B.M.A.: Branch Meeting.
Nov. 30.—South Australian Branch, B.M.A.: Branch Meeting.

Medical Appointments: Important Notice.

MEDICAL PRACTITIONERS are requested not to apply for any appointment mentioned below without having first communicated with the Honorary Secretary of the Branch concerned, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

New South Wales Branch (Medical Secretary, 135 Macquarie Street, Sydney)—All contract practice appointments in New South Wales.

Victorian Branch (Honorary Secretary, Medical Society Hall, East Melbourne): Associated Medical Services Limited; all Institutes or Medical Dispensaries; Australian Prudential Association, Proprietary, Limited; Federal Mutual Medical Benefit Society; Mutual National Provident Club; National Provident Association; Hospital or other appointments outside Victoria.

Queensland Branch (Honorary Secretary, B.M.A. House, 225 Wickham Terrace, Brisbane, B17): Brisbane Associated Friendly Societies' Medical Institute; Bundaberg Medical Institute. Members accepting LODGE appointments and those desiring to accept appointments to any COUNTRY HOSPITAL or position outside Australia are advised, in their own interests, to submit a copy of their Agreement to the Council before signing.

South Australian Branch (Honorary Secretary, 178 North Terrace, Adelaide): All Lodge appointments in South Australia; all Contract Practice appointments in South Australia.

Western Australian Branch (Honorary Secretary, 205 Saint George's Terrace, Perth): Norseman Hospital; all Contract Practice appointments in Western Australia. All government appointments with the exception of those of the Department of Public Health.

Editorial Notices.

MANUSCRIPTS forwarded to the office of this journal cannot under any circumstances be returned. Original articles forwarded for publication are understood to be offered to THE MEDICAL JOURNAL OF AUSTRALIA alone, unless the contrary be stated.

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